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# SPECIFICATIONS (FOR CONSTRUCTION CONTRACT)

SOLICITATION NO. W9128F-04-R-0024

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## **B1-B WEAPONS SYSTEM TRAINER FXBM 02-3002**



ELLSWORTH AFB, South Dakota

VOLUME 2 OF 3 [DIVISION 06-DIVISION 13]

JUNE 2004



U.S. Army Corps of Engineers  
Omaha District

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SPECIFICATIONS FOR CONSTRUCTION OF

B-1B WEAPONS SYSTEM TRAINER  
FXBM 023002

ELLSWORTH AFB, SOUTH DAKOTA

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## SECTION 06100A

## ROUGH CARPENTRY

**02/02**

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN FOREST &amp; PAPER ASSOCIATION (AF&amp;PA)

AF&PA T101 (1991; Supple 1993; Addenda Apr 1997; Supple T02) National Design Specification for Wood Construction

AF&PA T11 (1988) Manual for Wood Frame Construction  
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## ASTM INTERNATIONAL (ASTM)

ASTM A 307 (2002) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength

ASTM F 547 (1977; R 1995) Definitions of Terms Relating to Nails for Use with Wood and Wood-Based Materials

## APA - THE ENGINEERED WOOD ASSOCIATION (APA)

APA E445R (1980; Rev Jan 1996) Performance Standards and Policies for Structural-Use Panels

## FM GLOBAL (FM)

FM LPDS 1-49 (1995) Loss Prevention Data Sheet - Perimeter Flashing

## NATIONAL HARDWOOD LUMBER ASSOCIATION (NHLA)

NHLA Rules (1994) Rules for the Measurement & Inspection of Hardwood & Cypress

## NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)

NELMA Grading Rules (1997) Standard Grading Rules for Northeastern Lumber

## REDWOOD INSPECTION SERVICE (RIS)

RIS Grade Use (1998) Redwood Lumber Grades and Uses



## SOUTHERN CYPRESS MANUFACTURERS ASSOCIATION (SCMA)

SCMA Spec (1986; Supple No. 1, Aug 1993) Standard Specifications for Grades of Southern Cypress

## SOUTHERN PINE INSPECTION BUREAU (SPIB)

SPIB 1003 (1994; Supple 8 thru 11) Standard Grading Rules for Southern Pine Lumber

## U.S. DEPARTMENT OF COMMERCE (DOC)

PS1 (1995) Construction and Industrial Plywood (APA V995)

PS2 (1992) Wood-Based Structural-Use Panels (APA 5350)

## WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

WCLIB 17 (2000) Standard Grading Rules

## WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

WWPA Grading Rules (1999) Western Lumber Grading Rules 95

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-02 Shop Drawings

## Nailers and Nailing Strips; G-AO

Drawings of field erection details, including materials and methods of fastening nailers in conformance with Factory Mutual wind uplift rated systems specified in other Sections of these specifications.

## SD-07 Certificates

## Grading and Marking

Manufacturer's certificates (approved by an American Lumber Standards approved agency) attesting that lumber and material not normally grade marked meet the specified requirements. Certificate of Inspection for grade marked material by an American Lumber Standards Committee (ALSC) recognized inspection agency prior to shipment.

## 1.3 DELIVERY AND STORAGE

Materials shall be delivered to the site in undamaged condition, stored off ground in fully covered, well ventilated areas, and protected from extreme

changes in temperature and humidity.

## PART 2 PRODUCTS

### 2.1 LUMBER AND SHEATHING

#### 2.1.1 Grading and Marking

##### 2.1.1.1 Lumber Products

Solid sawn and finger-jointed lumber shall bear an authorized gradestamp or grademark recognized by ALSC, or an ALSC recognized certification stamp, mark, or hammerbrand. Surfaces that are to be exposed to view shall not bear grademarks, stamps, or any type of identifying mark. Hammer marking will be permitted on timbers when all surfaces will be exposed to view.

##### 2.1.1.2 Plywood and Other Sheathing Products

Materials shall bear the grademark or other identifying marks indicating grades of material and rules or standards under which produced, including requirements for qualifications and authority of the inspection organization. Except for plywood and wood structural panels, bundle marking will be permitted in lieu of marking each individual piece. Surfaces that are to be exposed to view shall not bear grademarks or other types of identifying marks.

#### 2.1.2 Sizes

Lumber and material sizes shall conform to requirements of the rules or standards under which produced. Unless otherwise specified, lumber shall be surfaced on four sides. Unless otherwise specified, sizes indicated are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the standard under which the product is produced.

#### 2.1.3 Moisture Content

At the time lumber and other materials are delivered and when installed in the work their moisture content shall be as follows:

a. Treated and Untreated Lumber: 4 inches or less, nominal thickness, 19 percent maximum. 5 inches or more, nominal thickness, 23 percent maximum in a 3 inch perimeter of the timber cross-section.

b. Materials Other Than Lumber: In accordance with standard under which product is produced.

#### 2.1.4 Sheathing

Sheathing shall be gypsum board or plywood, as indicated on drawings.

##### 2.1.4.1 Plywood

Plywood shall conform to PS1, APA E445R or PS2, Grade C-D or sheathing grade with exterior glue. Sheathing for roof and walls without corner bracing of framing shall have a span rating of 16/0 or greater for supports 16 inches on center and a span rating of 24/0 or greater for supports 24 inches on center.

### 2.1.5 Underlayment

#### 2.1.5.1 Plywood

Plywood shall conform to PS1, underlayment grade with exterior glue, or C-C (Plugged) exterior grade 11/32 inch thick, 4 feet wide.

### 2.1.6 Miscellaneous Wood Members

#### 2.1.6.1 Nonstress Graded Members

Members shall include bridging, corner bracing, furring, grounds, and nailing strips. Members shall be in accordance with TABLE I for the species used. Sizes shall be as follows unless otherwise shown:

Member	Size (inch)
Bridging	1 x 3 or 1 x 4 for use between members 2 x 12 and smaller; 2 x 4 for use between members larger than 2 x 12.
Furring	1 x 3.
Nailing strips	1 x 3 or 1 x 4 when used as interior finish, otherwise 2 inch stock.

#### 2.1.6.2 Blocking

Blocking shall be standard or number 2 grade.

### 2.2 ACCESSORIES AND NAILS

Markings shall identify both the strength grade and the manufacturer. Accessories and nails shall conform to the following:

#### 2.2.1 Anchor Bolts

ASTM A 307, size as indicated, complete with nuts and washers.

#### 2.2.2 Bolts: Lag, Toggle, and Miscellaneous Bolts and Screws

Type, size, and finish best suited for intended use. Finish options include zinc compounds, cadmium, and aluminum paint impregnated finishes.

#### 2.2.3 Clip Angles

Steel, 3/16 inch thick, size best suited for intended use; or zinc-coated steel or iron commercial clips designed for connecting wood members.

#### 2.2.4 Expansion Shields

Type and size best suited for intended use.

#### 2.2.5 Nails and Staples

ASTM F 547, size and type best suited for purpose; staples shall be as recommended by the manufacturer of the materials to be joined. For

sheathing and subflooring, length of nails shall be sufficient to extend 1 inch into supports. In general, 8-penny or larger nails shall be used for nailing through 1 inch thick lumber and for toe nailing 2 inch thick lumber; 16-penny or larger nails shall be used for nailing through 2 inch thick lumber. Nails used with treated lumber and sheathing shall be galvanized. Nailing shall be in accordance with the recommended nailing schedule contained in AF&PA T11. Where detailed nailing requirements are not specified, nail size and spacing shall be sufficient to develop an adequate strength for the connection. The connection's strength shall be verified against the nail capacity tables in AF&PA T101. Reasonable judgement backed by experience shall ensure that the designed connection will not cause the wood to split. If a load situation exceeds a reasonable limit for nails, a specialized connector shall be used.

### PART 3 EXECUTION

#### 3.1 INSTALLATION OF SHEATHING

##### 3.1.1 Plywood Panels

Sheathing shall be applied with edges 1/8 inch apart at side and end joints, and fastened at supported edges at 6 inches on center and at intermediate supports 12 inches on center unless otherwise shown. Fastening of edges shall be 3/8 inch from the edges. Wall sheathing shall extend over top and bottom tracks, and if applied horizontally the vertical joints shall be made over supports and staggered.

#### 3.2 INSTALLATION OF MISCELLANEOUS WOOD MEMBERS

##### 3.2.1 Bridging

Wood bridging shall have ends accurately bevel-cut to afford firm contact and shall be nailed at each end with two nails.

##### 3.2.2 Blocking

Blocking shall be provided as necessary for application of sheathing, wallboard, and other materials or building items. Blocking shall be cut to fit between framing members and rigidly nailed thereto.

##### 3.2.3 Nailers and Nailing Strips

Nailers and nailing strips shall be provided as necessary for the attachment of finish materials. Stacked nailers shall be assembled with spikes or nails spaced not more than 18 inches on center and staggered. Beginning and ending nails shall not be more than 6 inches for nailer end.

Ends of stacked nailers shall be offset approximately 12 inches in long runs and alternated at corners. Anchors shall extend through the entire thickness of the nailer. Strips shall be run in lengths as long as practicable, butt jointed, cut into wood framing members when necessary, and rigidly secured in place. Nailers and nailer installation for Factory Mutual wind uplift rated roof systems specified in other Sections of these specifications shall conform to the recommendations contained in FM LPDS 1-49.

##### 3.2.4 Furring Strips

Furring strips shall be provided at the locations shown. Furring strips shall be installed at 16 inches on center unless otherwise shown, run in

lengths as long as practicable, butt jointed and rigidly secured in place.

### 3.3 TABLES

TABLE I. SPECIES AND GRADE

Wall Sheathing, Furring						
Grading Rules	Species	Const Standard	No. 2 Comm	No. 2 Board Comm	No. 3 Comm	
NHLA Rules	Cypress			X		
NELMA Grading Rules	Northern White Cedar					X
	Eastern White Pine	X				
	Northern Pine	X				
	Balsam Fir					X
	Eastern Hemlock-Tamarack					X
RIS Grade Use	Redwood		X			
SCMA Spec	Cypress			X		
SPIB 1003	Southern Pine		X			
WCLIB 17	Douglas Fir-Larch	X				
	Hem-Fir	X				
	Sitka Spruce	X				
	Mountain Hemlock	X				
	Western Cedar	X				
WWPA Grading Rules	Douglas Fir-Larch	X				
	Hem-Fir	X				
	Idaho White Pine	X				
	Lodgepole Pine				X	
	Ponderosa Pine				X	
	Sugar Pine				X	
	Englemann Spruce				X	
	Douglas Fir South				X	
	Mountain Hemlock				X	
	Subalpine Fir				X	
	Western Cedar				X	

-- End of Section --

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SECTION 06200A

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## SECTION 06200A

## FINISH CARPENTRY

**11/01**

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM F 547 (1977; R 1995) Definitions of Terms  
Relating to Nails for Use with Wood and  
Wood-Based Materials

## AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)

AWPA C9 (1997) Plywood - Preservative Treatment by  
Pressure Processes

AWPA P5 (2001) Standard for Waterborne  
Preservatives

## NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)

NELMA Grading Rules (1997) Standard Grading Rules for  
Northeastern Lumber

## REDWOOD INSPECTION SERVICE (RIS)

RIS Grade Use (1998) Redwood Lumber Grades and Uses

## SOUTHERN CYPRESS MANUFACTURERS ASSOCIATION (SCMA)

SCMA Spec (1986; Supple No. 1, Aug 1993) Standard  
Specifications for Grades of Southern  
Cypress

## SOUTHERN PINE INSPECTION BUREAU (SPIB)

SPIB 1003 (1994; Supple 8 thru 11) Standard Grading  
Rules for Southern Pine Lumber

## WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

WCLIB 17 (2000) Standard Grading Rules

## WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

WWPA G-5 (1998) Western Lumber Grading Rules



## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-02 Shop Drawings

#### Finish Carpentry; G-AE

Drawings showing fabricated items and special mill and woodwork items. Drawings shall indicate materials and details of construction, methods of fastening, erection, and installation.

### SD-03 Product Data

#### Wood Items and Trim; G-AO

Manufacturer's printed data indicating the usage of engineered or recycled wood products, and environmentally safe preservatives.

### SD-04 Samples

#### Shower Bench lumber; G-AO

Samples shall be of sufficient size to show patterns, color ranges, and types, as applicable, of the material proposed to be used.

## 1.3 DELIVERY AND STORAGE

Materials shall be delivered to the site in undamaged condition, stored off ground in fully covered, well-ventilated areas, and protected from extreme changes in temperature and humidity.

## PART 2 PRODUCTS

### 2.1 WOOD ITEMS AND TRIM

The Contractor shall furnish products which optimize design by reducing the amount of wood used (engineered wood), by using recycled wood products and preservatives without arsenic or chromium when the products and methods are competitive in price or directed by the Contracting Officer. The Contractor shall comply with EPA requirements in accordance with Section 01670 RECYCLED / RECOVERED MATERIALS.

#### 2.1.1 Grading and Marking

Materials used for finish carpentry shall bear the grademark, stamp or other identifying marks indicating grades of material and rules or standards under which produced. Such identifying marks on a material shall be in accordance with the rule or standard under which the material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification. The inspection agency for lumber shall be certified by the Board of Review, American Lumber Standards Committee, to grade the species used. Except for plywood, wood structural

panels, and lumber, bundle marking will be permitted in lieu of marking each individual piece. Surfaces that are to be architecturally exposed to view shall not bear grademarks, stamps, or other types of identifying marks.

#### 2.1.1.2 Sizes and Patterns

Lumber sizes and patterns shall conform to rules or standards under which produced. Unless otherwise specified, lumber shall be surfaced on four sides. Sizes and patterns for materials other than lumber shall conform to requirements of the rules or standards under which produced. Size references, unless otherwise specified, are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the standard under which the product is produced.

#### 2.1.1.3 Moisture Content

The maximum moisture content of untreated trim and wood siding shall be 15 percent at the time of delivery to the jobsite and when installed. Moisture content of all other material shall be in accordance with the standard under which the product is produced.

#### 2.1.1.4 Preservative Treatment

##### 2.1.1.4.1 Plywood

Plywood shall be treated in accordance with AWPA C9 with waterborne preservatives listed in AWPA P5 to a retention level as follows:

- a. 0.25 pcf intended for above ground use.
- b. 0.4 pcf intended for ground contact and fresh water use.

#### 2.1.1.5 Trim

##### 2.1.1.5.1 Wood

Trim and shower bench lumber shall be species and grade listed in TABLE I at the end of this section. Sizes shall be as indicated.

#### 2.1.1.6 Moldings

Moldings shall be of the pattern indicated and shall be of a grade compatible with the finish specified.

### 2.2 NAILS

Nails shall be the size and type best suited for the purpose and shall conform to ASTM F 547. Nails shall be hot-dip galvanized or aluminum when used on exterior work. For siding, length of nails shall be sufficient to extend 1-1/2 inches into supports, including wood sheathing over framing. Screws for use where nailing is impractical shall be size best suited for purpose.

## PART 3 EXECUTION

### 3.1 MOLDING AND INTERIOR TRIM

Molding and interior trim shall be installed straight, plumb, level and with closely fitted joints. Exposed surfaces shall be machine sanded at

the mill. Molded work shall be coped at returns and interior angles and mitered at external corners. Intersections of flatwork shall be shouldered to ease any inherent changes in plane. Window and door trim shall be provided in single lengths. Blind nailing shall be used to the extent practicable, and face nailing shall be set and stopped with a nonstaining putty to match the finish applied. Screws shall be used for attachment to metal; setting and stopping of screws shall be of the same quality as required where nails are used.

### 3.2 SHOWER BENCH LUMBER

Provide clear grain Teak lumber for suitable use in shower room application. Ease all edges.

### 3.3 TABLES

TABLE I. SPECIES AND GRADE TABLES

Grading Rules	Species	Choice	Clear	C Select	C & Better
NELMA Grading Rules					
	Eastern Cedar				X
	Eastern Hemlock		X		
	Tamarack				X
	Eastern W. Pine				X
	Northern Pine				X
	Eastern Spruce			X	
	Balsam Fir		X		
RIS Grade Use	Redwood			X	
SCMA Spec	Cypress			X	
SPIB 1003	Southern Pine				X
WCLIB 17	Douglas Fir				X
	Larch				X
	Hemlock Fir				X
	Mountain Hemlock				X
	Sitka Spruce				X
WWPA G-5					
	Douglas Fir				X
	Larch				X
	Hemlock Fir		X		
	Mountain Hemlock				X
	Western Larch		X		
	Idaho White Pine	X			
	Lodgepole Pine		X		
	Ponderosa Pine		X		
	Sugar Pine		X		
	Englemann Spruce		X		
	Douglas Fir South		X		
	Subalpine Fir		X		
	Teak		X		

NOTE 1: Western Cedar under WCLIB 17 shall be Grade B; and under WWPA G-5, Western Cedar shall be Grade B bevel for siding and Grade A for trim.

NOTE 2: Except as specified in NOTE 3 below, siding and exterior trim shall be any of the species listed above. Interior trim shall be any one

TABLE I. SPECIES AND GRADE TABLES

Grading Rules	Species	Choice	Clear	C Select	C & Better
of the species listed above and the highest grade of the species for stain or natural finish and one grade below highest grade of species for paint finish.					

NOTE 3: Southern Yellow Pine, Douglas Fir, Larch, Western Larch, and Tamarack shall not be used where painting is required and may be used on exterior work only when approved and stained with a preservative type stain.

NOTE 4: Teak lumber shall be clear grain and of suitable use for shower room application.

-- End of Section --

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DIVISION 06 - WOOD AND PLASTICS

SECTION 06410A

LAMINATE CLAD ARCHITECTURAL CASEWORK

11/01

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## SECTION 06410A

## LAMINATE CLAD ARCHITECTURAL CASEWORK

**11/01**

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- |             |  |
|-------------|--|
| ANSI A161.2 | (1998) Decorative Laminate Countertops,<br>Performance Standards for Fabricated High<br>Pressure |
| ANSI A208.1 | (1999) Particleboard   |
| ANSI A208.2 | (1994) Medium Density Fiberboard (MDF)   |

## ASTM INTERNATIONAL (ASTM)

- |             |  |
|-------------|--|
| ASTM D 1037 | (1999) Evaluating Properties of Wood-Base<br>Fiber and Particle Panel Materials                        |
| ASTM F 547  | (1977; R 1995) Definitions of Terms<br>Relating to Nails for Use with Wood and<br>Wood-Based Materials |

## ARCHITECTURAL WOODWORK INSTITUTE (AWI)

- |               |                              |
|---------------|------------------------------|
| AWI Qual Stds | (1999) AWI Quality Standards |
|---------------|------------------------------|

## BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

- |             |                         |
|-------------|-------------------------|
| BHMA A156.9 | (1994) Cabinet Hardware |
|-------------|-------------------------|

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- |             |  |
|-------------|--|
| NEMA LD 3   | (2000) High-Pressure Decorative Laminates  |
| NEMA LD 3.1 | (1995) Performance, Application,<br>Fabrication, and Installation of<br>High-Pressure Decorative Laminates |

## WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

- |               |                                       |
|---------------|---------------------------------------|
| WDMA I.S. 1-A | (1997) Architectural Wood Flush Doors |
|---------------|---------------------------------------|

## 1.2 GENERAL DESCRIPTION

Work in this section includes laminate clad custom casework cabinets and vanities as shown on the drawings and as described in this specification.

This Section includes high-pressure laminate surfacing and cabinet hardware. The Contractor shall comply with EPA requirements in accordance with Section 01670 RECYCLED / RECOVERED MATERIALS. All exposed and semi-exposed surfaces, whose finish is not otherwise noted on the drawings or finish schedule, shall be sanded smooth and shall receive a clear finish of polyurethane.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. All items designated with a "G", including product literature, calculations, component data, certificates, diagrams, drawings, and samples shall be submitted concurrently in one complete system submittal. Omission of any required submittal item from the package shall be sufficient cause for disapproval of the entire submittal. Unless otherwise indicated in the submittal review commentary, disapproval of any item within the package shall require a re-submittal of the entire system package, in which all deficiencies shall be corrected. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES.

#### SD-02 Shop Drawings

Shop Drawings; G-AE  
Installation

Shop drawings showing all fabricated casework items in plan view, elevations and cross-sections to accurately indicate materials used, details of construction, dimensions, methods of fastening and erection, and installation methods proposed. Shop drawing casework items shall be clearly cross-referenced to casework items located on the project drawings. Shop drawings shall include a color schedule of all casework items to include all countertop, exposed, and semi-exposed cabinet finishes to include finish material manufacturer, pattern, and color.

#### SD-03 Product Data

Wood Materials; G-AE  
Wood Finishes; G-AE  
Finish Schedule; G-AE

Descriptive data which provides narrative written verification of all types of construction materials and finishes, methods of construction, etc. not clearly illustrated on the submitted shop drawings. Data shall provide written verification of conformance with AWI Qual Stds for the quality indicated to include materials, tolerances, and types of construction. Both the manufacturer of materials and the fabricator shall submit available literature which describes re-cycled product content, operations and processes in place that support efficient use of natural resources, energy efficiency, emissions of ozone depleting chemicals, management of water and operational waste, indoor environmental quality, and other production techniques supporting sustainable design and products.

#### SD-04 Samples



Plastic Laminates; G-AE

Wood Finish; G-AE

Two samples of each plastic laminate pattern and color. Samples shall be a minimum of 5 by 7 inches in size.

Cabinet Hardware; G-AE

One sample of each cabinet hardware item specified to include hinges, pulls, drawer glides, and cabinet latches.

#### SD-07 Certificates

Quality Assurance; G-AE

Laminate Clad Casework; G-AE

A quality control statement which illustrates compliance with and understanding of AWI Qual Stds requirements, in general, and the specific AWI Qual Stds requirements provided in this specification. The quality control statement shall also certify a minimum of ten years contractor's experience in laminate clad casework fabrication and construction. The quality control statement shall provide a list of a minimum of five successfully completed projects of a similar scope, size, and complexity.

### 1.4 QUALITY ASSURANCE

Unless otherwise noted on the drawings, all materials, construction methods, and fabrication shall conform to and comply with the custom grade quality standards as outlined in AWI Qual Stds, Section 400G and Section 400B for laminate clad cabinets. These standards shall apply in lieu of omissions or specific requirements in this specification. Contractors and their personnel engaged in the work shall be able to demonstrate successful experience with work of comparable extent, complexity and quality to that shown and specified. Contractor must demonstrate knowledge and understanding of AWI Qual Stds requirements for the quality grade indicated.

### 1.5 DELIVERY AND STORAGE

Casework may be delivered assembled to the fullest extent possible. All units shall be delivered to the site in undamaged condition, stored off the ground in fully enclosed areas, and protected from damage. The storage area shall be well ventilated and not subject to extreme changes in temperature or humidity.

### 1.6 SEQUENCING AND SCHEDULING

Work shall be coordinated with other trades. Units shall not be installed in any room or space until painting, and ceiling installation are complete within the room where the units are located. Floor cabinets shall be installed before finished flooring materials are installed.

### 1.7 PROJECT/SITE CONDITIONS

Field measurements shall be verified as indicated in the shop drawings before fabrication.

## PART 2 PRODUCTS

### 2.1 WOOD MATERIALS

#### 2.1.1 Lumber

All framing lumber shall be kiln-dried Grade III to dimensions as shown on the drawings. Frame front, where indicated on the drawings, shall be nominal 3/4 inch hardwood.

##### 2.1.1.1 Standing and Running Trim

Standing or running trim casework components which are specified to receive a transparent finish shall be red oak hardwood species, plain sawn. AWI grade shall be custom. Location, shape, and dimensions shall be as indicated on the drawings.

#### 2.1.2 Panel Products

##### 2.1.2.1 Plywood

All plywood panels used for framing purposes shall be veneer core hardwood plywood, AWI Qual Stds Grade AA. Nominal thickness of plywood panels shall be as indicated in this specification and on the drawings.

##### 2.1.2.2 Particleboard

All particleboard shall be industrial grade, medium density (40 to 50 pounds per cubic foot), 3/4 inch thick. A moisture-resistant particleboard in grade Type 2-M-2 or 2-M-3 shall be used as the substrate for plastic laminate covered countertops and other areas subjected to moisture. Particleboard shall meet the minimum standards listed in ASTM D 1037 and ANSI A208.1.

##### 2.1.2.3 Medium Density Fiberboard

Medium density fiberboard (MDF) shall be an acceptable panel substrate where noted on the drawings. Medium density fiberboard shall meet the minimum standards listed in ANSI A208.2.

### 2.2 SOLID POLYMER MATERIAL

Solid surfacing casework components shall conform to the requirements of Section 06650 SOLID POLYMER FABRICATIONS.

### 2.3 HIGH PRESSURE DECORATIVE LAMINATE (HPDL)

All plastic laminates shall meet the requirements of NEMA LD 3 and ANSI A161.2 for high-pressure decorative laminates. Design, colors, surface finish and texture, and locations shall be as indicated on Section 09915 COLOR SCHEDULE. Plastic laminate types and nominal minimum thicknesses for casework components shall be as indicated in the following paragraphs.

#### 2.3.1 Horizontal General Purpose Standard (HGS) Grade

Horizontal general purpose standard grade plastic laminate shall be 0.048 inches (plus or minus 0.005 inches) in thickness. This laminate grade is intended for horizontal surfaces where postforming is not required.

### 2.3.2 Vertical General Purpose Standard (VGS) Grade

Vertical general purpose standard grade plastic laminate shall be 0.028 inches (plus or minus 0.004 inches) in thickness. This laminate grade is intended for exposed exterior vertical surfaces of casework components where postforming is not required.

### 2.3.3 Cabinet Liner Standard (CLS) Grade

Cabinet liner standard grade plastic laminate shall be 0.020 inches in thickness. This laminate grade is intended for light duty semi-exposed interior surfaces of casework components.

### 2.3.4 Backing Sheet (BK) Grade

Undecorated backing sheet grade laminate is formulated specifically to be used on the backside of plastic laminated panel substrates to enhance dimensional stability of the substrate. Backing sheet thickness shall be 0.020 inches. Backing sheets shall be provided for all laminated casework components where plastic laminate finish is applied to only one surface of the component substrate.

### 2.4 THERMOSET DECORATIVE OVERLAYS (MELAMINE)

Thermoset decorative overlays (melamine panels) shall be used for casework cabinet interior, drawer interior, and all semi-exposed surfaces.

### 2.5 EDGE BANDING

Edge banding for casework doors and drawer fronts shall be PVC vinyl and shall be 0.020 inch thick. Material width shall be as indicated on the drawings. Color and pattern shall match exposed door and drawer front laminate pattern and color.

### 2.6 EXPOSED COUNTERTOP EDGES

Provide red oak exposed countertop edge where indicated in drawings. Species, type of cut and wood finish to match door veneer as specified in Section 08210 WOOD DOORS.

### 2.7 CABINET HARDWARE

All hardware shall conform to BHMA A156.9, unless otherwise noted, and shall consist of the following components:

- a. Door Hinges: frame concealed type, BHMA No. B01612, Finish: Manufacturer's standard .
- b. Cabinet Pulls: rectangular flush recessed type, BHMA No. B02201, Finish: 626 "Brushed Chrome".
- c. Drawer Slide: Side mounted type, BHMA No. B05051 with full extension and a minimum 100 pound load capacity. Slides shall include a positive stop to avoid accidental drawer removal.
- d. Adjustable Shelf Support System:

- 1) Multiple holes with self-locking or wood pin supports.

e. Cabinet Latches: Roller catch type, BHMA No. B03091, Finish: Manufacturer's standard.

## 2.8 FASTENERS

Nails, screws, and other suitable fasteners shall be the size and type best suited for the purpose and shall conform to ASTM F 547 where applicable.

## 2.9 ADHESIVES, CAULKS, AND SEALANTS

### 2.9.1 Adhesives

Adhesives shall be of a formula and type recommended by AWI. Adhesives shall be selected for their ability to provide a durable, permanent bond and shall take into consideration such factors as materials to be bonded, expansion and contraction, bond strength, fire rating, and moisture resistance. Adhesives shall meet local regulations regarding VOC emissions and off-gassing.

#### 2.9.1.1 Wood Joinery

Adhesives used to bond wood members shall be a Type II for interior use urea-formaldehyde resin formula or a polyvinyl acetate resin emulsion. Adhesives shall withstand a bond test as described in WDMA I.S. 1-A.

#### 2.9.1.2 Laminate Adhesive

Adhesive used to join high-pressure decorative laminate to wood shall be a water-based contact adhesive or adhesive consistent with AWI and laminate manufacturer's recommendations. PVC edgebanding shall be adhered using a polymer-based hot melt glue.

### 2.9.2 Caulk

Caulk used to fill voids and joints between laminated components and between laminated components and adjacent surfaces shall be clear, 100 percent silicone.

### 2.9.3 Sealant

Sealant shall be of a type and composition recommended by the substrate manufacturer to provide a moisture barrier at sink cutouts and all other locations where unfinished substrate edges may be subjected to moisture.

## 2.10 WOOD FINISHES

Paint, stain, varnish and their applications required for laminate clad casework components shall be as indicated in Section 09915 COLOR SCHEDULE. Color and location shall be as indicated on the drawings.

## 2.11 FABRICATION

Fabrication and assembly of components shall be accomplished at the shop site to the maximum extent possible. Construction and fabrication of cabinets and their components shall meet or exceed the requirements for AWI custom grade unless otherwise indicated in this specification. Cabinet style, in accordance with AWI Qual Stds, Section 400-G descriptions, shall be flush overlay.

#### 2.11.1 Base and Wall Cabinet Case Body

#### 2.11.2 Cabinet Floor Base

Fabricate in accordance with the custom grade quality standards as outlined in AWI Qual Stds.

#### 2.11.3 Cabinet Door and Drawer Fronts

Door and drawer fronts shall be fabricated from 3/4 inch medium density particleboard or 3/4 inch medium density fiberboard (MDF). All door and drawer front edges shall be surfaced with PVC edgebanding, color and pattern as indicated in Section 09915 COLOR SCHEDULE.

#### 2.11.4 Drawer Assembly

Drawer components shall consist of a removable drawer front, sides, backs, and bottom. Drawer components shall be constructed of the following materials and thicknesses:

- a. Drawer Sides and Back For Thermoset Decorative Overlay (melamine) Finish: 1/2 inch thick medium density particleboard or MDF fiberboard substrate.

##### 2.11.4.1 Drawer Assembly Joinery Method

- a. Multiple dovetail (all corners) glued under pressure.
- b. Doweled, glued under pressure.
- c. Lock shoulder, glued and pin nailed.
- d. Bottoms shall be set into sides, front, and back, 1/4 inch deep groove with a minimum 3/8 inch standing shoulder.

#### 2.11.5 Shelving

Shelving shall be fabricated from 3/4 inch medium density particleboard or 3/4 inch medium density fiberboard (MDF) or 3/4 inch veneer core plywood. All shelving top and bottom surfaces shall be finished with thermoset decorative overlay (melamine). Shelf edges shall be finished in a PVC edgebanding.

##### 2.11.5.1 Shelf Support System

The shelf support system shall be:

Pin Hole Method. Holes shall be drilled on the interior surface of the cabinet side walls. Holes shall be evenly spaced in two vertical columns. The holes in each column shall be spaced at 1 inch increments starting 6 inches from the cabinet interior bottom and extending to within 6 inches of the top interior surface of the cabinet. Holes shall be drilled to provide a level, stable surface when the shelf is resting on the shelf pins. Hole diameter shall be coordinated with pin insert size to provide a firm, tight fit.

#### 2.11.6 Laminate Clad Countertops

Laminate countertop substrate shall be constructed of 3/4 inch medium density fiberboard (MDF). The substrate shall be moisture-resistant where countertops receive sinks, lavatories, or are subjected to liquids. All substrates shall have sink cutout edges sealed with appropriate sealant against moisture. No joints shall occur at any cutouts. A balanced backer sheet is required.

##### 2.11.6.1 Edge Style

Front and exposed side countertop edges shall be in shapes and to dimensions as shown on the drawings. The countertop edge material shall be:

Hardwood. Species, finish, profile, shape, and dimensions shall be as indicated on the drawings. Hardwood edge shall overlap the exposed countertop laminate edge and shall be installed flush with the countertop laminate surface.

##### 2.11.6.2 Laminate Clad Splashes

Countertop splash substrate shall be 3/4 inch MDF fiberboard. Laminate clad backsplash shall be loose, to be installed at the time of countertop installation. Side splashes shall be straight profile and provided loose, to be installed at the time of countertop installation. Back and side splash laminate pattern and color shall match the adjacent countertop laminate.

##### 2.11.7 Laminate Application

Laminate application to substrates shall follow the recommended procedures and instructions of the laminate manufacturer and NEMA LD 3.1, using tools and devices specifically designed for laminate fabrication and application.

Provide a balanced backer sheet (Grade BK) wherever only one surface of the component substrate requires a plastic laminate finish. Apply required grade of laminate in full uninterrupted sheets consistent with manufactured sizes using one piece for full length only, using adhesives specified herein or as recommended by the manufacturer. Fit corners and joints hairline. All laminate edges shall be machined flush, filed, sanded, or buffed to remove machine marks and eased (sharp corners removed). Clean up at easing shall be such that no overlap of the member eased is visible. Fabrication shall conform to NEMA LD 3.1 and ANSI A161.2. Laminate types and grades for component surfaces shall be as follows unless otherwise indicated on the drawings:

###### a. Base/Wall Cabinet Case Body.

1) Exterior (exposed) surfaces to include exposed and semi-exposed face frame surfaces: HPDL Grade VGS.

2) Interior (semi-exposed) surfaces to include interior back wall, bottom, and side walls: Thermoset Decorative Overlay (melamine).

###### b. Adjustable Shelving.

1) Top and bottom surfaces: Thermoset Decorative Overlay (melamine).

2) All edges: PVC edgebanding.

c. Door, Drawer Fronts, Access Panels.

1) Exterior (exposed) and interior (semi-exposed) faces: HPDL Grade VGS

2) Edges: PVC edgebanding.

d. Drawer Assembly.

All interior and exterior surfaces: Thermoset Decorative Overlay (melamine).

f. Countertops and Splashes.

1) All exposed and semi-exposed surfaces: HPDL Grade HGS

2.11.7.1 Tolerances

Flushness, flatness, and joint tolerances of laminated surfaces shall meet the AWI Qual Stds custom grade requirements.

2.11.8 Finishing

2.11.8.1 Filling

No fasteners shall be exposed on laminated surfaces. All nails, screws, and other fasteners in non-laminated cabinet components shall be countersunk and the holes filled with wood filler consistent in color with the wood species.

2.11.8.2 Sanding

All surfaces requiring coatings shall be prepared by sanding with a grit and in a manner that scratches will not show in the final system.

2.11.8.3 Coatings

Types, method of application and location of casework finishes shall be in accordance with the finish schedule, drawings and Section 09900 PAINTING, GENERAL. All cabinet reveals shall be painted.

PART 3 EXECUTION

3.1 INSTALLATION

Installation shall comply with applicable requirements for AWI Qual Stds custom quality standards. Countertops and fabricated assemblies shall be installed level, plumb, and true to line, in locations shown on the drawings. Cabinets and other laminate clad casework assemblies shall be attached and anchored securely to the floor and walls with mechanical fasteners that are appropriate for the wall and floor construction.

### 3.1.1 Anchoring Systems

#### 3.1.1.1 Floor

Base cabinets shall utilize a floor anchoring system . Anchoring and mechanical fasteners shall not be visible from the finished side of the casework assembly. Cabinet assemblies shall be attached to anchored bases without visible fasteners . Where assembly abutts a wall surface, anchoring shall include a minimum 1/2 inch thick lumber or panel product hanging strip, minimum 2-1/2 inch width; securely attached to the top of the wall side of the cabinet back.

#### 3.1.1.2 Wall

Cabinets and vanities to be wall mounted shall utilize minimum 1/2 inch thick lumber or panel product hanging strips, minimum 2-1/2 inch width; securely attached to the wall side of the cabinet back, both top and bottom.

### 3.1.2 Countertops

Countertops shall be installed in locations as indicated on the drawings. Countertops shall be fastened to supporting casework structure with mechanical fasteners, hidden from view. All joints formed by the countertop or countertop splash and adjacent wall surfaces shall be filled with a clear silicone caulk.

#### 3.1.2.1 Loose Splashes

Loose back and side splashes shall be adhered to both the countertop surface perimeter and the adjacent wall surface with adhesives appropriate for the type of materials to be adhered. Joints between the countertop surface and splash shall be filled with clear silicone caulk in a smooth consistent concave bead. Bead size shall be the minimum necessary to fill the joint and any surrounding voids or cracks.

### 3.1.3 Hardware

Casework hardware shall be installed in types and locations as indicated on the drawings. Where fully concealed European-style hinges are specified to be used with particleboard or fiberboard doors, the use of plastic or synthetic insertion dowels shall be used to receive 3/16 inch "Euro screws". The use of wood screws without insertion dowels is prohibited.

### 3.1.4 Doors, Drawers and Removable Panels

The fitting of doors, drawers and removable panels shall be accomplished within target fitting tolerances for gaps and flushness in accordance with AWI Qual Stds custom grade requirements.

### 3.1.5 Plumbing Fixtures

Sinks, sink hardware, and other plumbing fixtures shall be installed in locations as indicated on the drawings and in accordance with Section 15400A PLUMBING, GENERAL PURPOSE.

-- End of Section --



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DIVISION 06 - WOOD AND PLASTICS

SECTION 06650

SOLID POLYMER (SOLID SURFACING) FABRICATIONS

10/03

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## SECTION 06650

SOLID POLYMER (SOLID SURFACING) FABRICATIONS  
10/03

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- |             |  |
|-------------|--|
| ANSI A108.1 | (1999) Installation of Ceramic Tile;<br>including A108.1A-C, 108.4-.13, 118.1-.10,<br>A136.1 |
| ANSI Z124.3 | (1995) Plastic Lavatories  |
| ANSI Z124.6 | (1997) Plastic Sinks   |

## ASTM INTERNATIONAL (ASTM)

- |             |  |
|-------------|--|
| ASTM D 570  | (1998) Water Absorption of Plastics  |
| ASTM D 638  | (2002) Tensile Properties of Plastics  |
| ASTM D 696  | (1998) Coefficient of Linear Thermal<br>Expansion of Plastics Between Minus 30<br>degrees C and 30 degrees C With a Vitreous<br>Silica Dilatometer |
| ASTM D 2583 | (1995; R 2001e1) Indentation Hardness of<br>Rigid Plastics by Means of a Barcol<br>Impressor   |
| ASTM E 84   | (2001) Surface Burning Characteristics of<br>Building Materials  |
| ASTM G 21   | (1996; R 2002) Determining Resistance of<br>Synthetic Polymeric Materials to Fungi   |

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- |           |   |
|-----------|---|
| NEMA LD 3 | (2000) High-Pressure Decorative Laminates |
|-----------|---|

## 1.2 GENERAL DESCRIPTION

Work in this section includes counter and vanity tops, splashes, window sills, thresholds and other items utilizing solid polymer (solid surfacing) fabrication as shown on the drawings and as described in this specification.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

Shop Drawings; G-AE  
Installation  
Counter and Vanity Tops; G-AE

Shop Drawings indicating locations, dimensions, component sizes, fabrication and joint details, attachment provisions, installation details, and coordination requirements with adjacent work.

#### SD-03 Product Data

Solid polymer material  
Qualifications  
Fabrications

Product data indicating product description, fabrication information, and compliance with specified performance requirements for solid polymer, joint adhesive, sealants, and heat reflective tape. Both the manufacturer of materials and the fabricator shall submit a detailed description of operations and processes in place that support efficient use of natural resources, energy efficiency, emissions of ozone depleting chemicals, management of water and operational waste, indoor environmental quality, and other production techniques supporting sustainable design and products.

#### SD-04 Samples

Material; G-AE

A minimum 4 by 4 inch sample of each color and pattern for approval. Samples shall indicate full range of color and pattern variation. Approved samples shall be retained as a standard for this work.

#### SD-06 Test Reports

Solid polymer material

Test report results from an independent testing laboratory attesting that the submitted solid polymer material meets or exceeds each of the specified performance requirements.

#### SD-07 Certificates

Fabrications  
Qualifications

Solid polymer manufacturer's certification attesting to

fabricator qualification approval.

#### SD-10 Operation and Maintenance Data

##### Clean-up

A minimum of six copies of maintenance data indicating manufacturer's care, repair and cleaning instructions. Maintenance video shall be provided, if available. Maintenance kit for matte finishes shall be submitted.

#### 1.4 DELIVERY, STORAGE AND HANDLING

Materials shall not be delivered to project site until areas are ready for installation. Materials shall be stored indoors and adequate precautions taken to prevent damage to finished surfaces. Protective coverings shall be provided to prevent physical damage or staining following installation, for duration of project.

#### 1.5 WARRANTY

Manufacturer's warranty of ten years against defects in materials, excluding damages caused by physical or chemical abuse or excessive heat, shall be provided. Warranty shall provide for material and labor for replacement or repair of defective material for a period of ten years after component installation.

#### 1.6 QUALIFICATIONS

To insure warranty coverage, solid polymer fabricators shall be certified to fabricate by the solid polymer material manufacturer being utilized. All fabrications shall be marked with the fabricator's certification label affixed in an inconspicuous location. Fabricators shall have a minimum of 5 years of experience working with solid polymer materials.

### PART 2 PRODUCTS

#### 2.1 MATERIAL

Solid polymer material shall be a homogeneous filled solid polymer; not coated, laminated or of a composite construction; meeting ANSI Z124.3 and ANSI Z124.6 requirements. Material shall have minimum physical and performance properties specified. Superficial damage to a depth of 0.01 inch shall be repairable by sanding or polishing. Material thickness shall be as indicated on the drawings. In no case shall material be less than 1/4 inch in thickness.

##### 2.1.1 Cast, 100 Percent Acrylic Polymer Solid Surfacing Material

Cast, 100 percent acrylic solid polymer material shall be composed of acrylic polymer, mineral fillers, and pigments and shall meet the following minimum performance requirements:

PROPERTY	REQUIREMENT (min. or max.)	TEST PROCEDURE
Tensile Strength	5800 psi (min.)	ASTM D 638

PROPERTY	REQUIREMENT (min. or max.)	TEST PROCEDURE
Hardness	55-Barcol Impressor (min.)	ASTM D 2583
Thermal Expansion	.000023 in/in/F (max.)	ASTM D 696
Boiling water Surface Resistance	No Change	NEMA LD 3-3.05
High Temperature Resistance	No Change	NEMA LD 3-3.06
Impact Resistance (Ball drop)		NEMA LD 3-303
1/2" sheet	140", 1/2 lb ball, no failure	
3/4" sheet	200", 1/2 lb ball, no failure	
Mold & Mildew Growth	No growth	ASTM G 21
Bacteria Growth	No Growth	ASTM G 21
Liquid Absorption (Weight in 24 hrs.)	0.1% max.	ASTM D 570
Flammability		ASTM E 84
Flame Spread	25 max.	
Smoke Developed	30 max	

#### 2.1.2 Material Patterns and Colors

Patterns and colors for all solid polymer components and fabrications shall be those indicated on the project color schedule in Section 09915 COLOR SCHEDULE. Pattern and color shall occur, and shall be consistent in appearance, throughout the entire depth (thickness) of the solid polymer material.

#### 2.1.3 Surface Finish

Exposed finished surfaces and edges shall receive a uniform appearance. Exposed surface finish shall be matte; gloss rating of 5-20.

### 2.2 ACCESSORY PRODUCTS

Accessory products, as specified below, shall be manufactured by the solid polymer manufacturer or shall be products approved by the solid polymer manufacturer for use with the solid polymer materials being specified.

#### 2.2.1 Seam Adhesive

Seam adhesive shall be a two-part adhesive kit to create permanent, inconspicuous, non-porous, hard seams and joints by chemical bond between

solid polymer materials and components to create a monolithic appearance of the fabrication. Adhesive shall be approved by the solid polymer manufacturer. Adhesive shall be color-matched to the surfaces being bonded where solid-colored, solid polymer materials are being bonded together. The seam adhesive shall be clear or color matched where particulate patterned, solid polymer materials are being bonded together.

#### 2.2.2 Panel Adhesive

Panel adhesive shall be neoprene based panel adhesive meeting ANSI A108.1, Underwriter's Laboratories (UL) listed. This adhesive shall be used to bond solid polymer components to adjacent and underlying substrates.

#### 2.2.3 Silicone Sealant

Sealant shall be a mildew-resistant, FDA and UL listed silicone sealant or caulk in a clear formulation. The silicone sealant shall be approved for use by the solid polymer manufacturer. Sealant shall be used to seal all expansion joints between solid polymer components and all joints between solid polymer components and other adjacent surfaces such as walls, floors, ceiling, and plumbing fixtures.

### 2.3 FABRICATIONS

Components shall be factory or shop fabricated to the greatest extent practical to sizes and shapes indicated, in accordance with approved Shop Drawings and manufacturer's requirements. Factory cutouts shall be provided for sinks, lavatories, and plumbing fixtures where indicated on the drawings. Contours and radii shall be routed to template, with edges smooth. Defective and inaccurate work will be rejected.

#### 2.3.1 Joints and Seams

Joints and seams shall be formed between solid polymer components using manufacturer's approved seam adhesive. Joints shall be inconspicuous in appearance and without voids to create a monolithic appearance.

#### 2.3.2 Edge Finishing

Rout and finish component edges to a smooth, uniform appearance and finish. Edge shapes and treatments, including any inserts, shall be as detailed on the drawings. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.

#### 2.3.3 Counter and Vanity Top Splashes

Backsplashes and end splashes shall be fabricated from 1/2 inch thick solid surfacing material and shall be 4 inches high. Backsplashes and end splashes shall be provided at locations indicated on the drawings. Backsplashes shall be shop fabricated and be loose, to be field attached.

##### 2.3.3.1 End Splashes

End splashes shall be provided loose for installation at the jobsite after horizontal surfaces to which they are to be attached have been installed.

#### 2.3.4 Window Sills

Window sills shall be fabricated from 1/2 inch thick solid surfacing, solid

polymer material. Dimensions, edge shape, and other details shall be as indicated on the drawings.

#### 2.3.5 Counter and Vanity Tops

All solid surfacing, solid polymer counter top and vanity top components shall be fabricated from 3/4 inch thick material. Edge details, dimensions, locations, and quantities shall be as indicated on the Drawings. Counter tops shall be complete with 4 inch high loosewhere indicated on the drawings. Attach 2 inch wide reinforcing strip of polymer material under each horizontal counter top seam.

#### 2.3.6 Thresholds

All solid polymer (solid surfacing) thresholds will use material as specified above. Color selection as specified in Section 09915 COLOR SCHEDULE.

### PART 3 EXECUTION

#### 3.1 COORDINATION

In most instances, installation of solid polymer fabricated components and assemblies will require strong, correctly located structural support provided by other trades. To provide a stable, sound, secure installation, close coordination is required between the solid polymer fabricator/installer and other trades to insure that necessary structural wall support, cabinet counter top structural support, proper clearances, and other supporting components are provided for the installation of window sills, countertops, splashes, and all other solid polymer fabrications to the degree and extent recommended by the solid polymer manufacturer. Contractor shall appropriate staging areas for solid polymer fabrications.

#### 3.2 INSTALLATION

##### 3.2.1 Components

All components and fabricated units shall be installed plumb, level, and rigid. Field joints between solid polymer components to provide a monolithic appearance shall be made using solid polymer manufacturer's approved seam adhesives, with joints inconspicuous in the finished work. Metal or vitreous china sinks and lavatory bowls shall be attached to counter tops using solid polymer manufacturer's recommended clear silicone sealant and mounting hardware.

##### 3.2.1.1 Loose Counter Top Splashes

Loose splashes shall be mounted in locations as noted on the drawings. Loose splashes shall be adhered to the counter top with a color matched silicone sealant when the solid polymer components are solid colors. Adhesion of particulate patterned solid polymer splashes to counter tops shall utilize a clear silicone sealant.

##### 3.2.2 Thresholds

Solid polymer (solid surfacing) thresholds are installed as specified in Section 09310 CERAMIC TILE.

### 3.2.3 Silicone Sealant

A clear, silicone sealant or caulk shall be used to seal all expansion joints between solid polymer components and all joints between solid polymer components and other adjacent surfaces such as walls, floors, ceiling, and plumbing fixtures. Sealant bead shall be smooth and uniform in appearance and shall be the minimum size necessary to bridge any gaps between the solid surfacing material and the adjacent surface. Bead shall be continuous and run the entire length of the joint being sealed.

### 3.3 CLEAN-UP

Components shall be cleaned after installation and covered to protect against damage during completion of the remaining project items. Components damaged after installation by other trades will be repaired or replaced at the General Contractor's cost. Component supplier will provide a repair/replace cost estimate to the General Contractor who shall approve estimate before repairs are made. The Contractor shall submit maintenance data as specified in the Submittals paragraph, under SD-10.

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SECTION 07131

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03/02

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## SECTION 07131

ELASTOMERIC SHEET WATERPROOFING  
03/02

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM D 1004	(1994a) Initial Tear Resistance of Plastic Film and Sheeting
ASTM D 1204	(1994) Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature
ASTM D 2136	(1994; R 1998) Coated Fabrics - Low-Temperature Bend Test
ASTM D 3045	(1992; R 1997) Practice for Heat Aging of Plastics Without Load
ASTM D 412	(1998a) Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
ASTM D 429	(1981; R 1993) Standard Test Methods for Rubber Property-Adhesion to Rigid Substrates
ASTM D 570	(1998) Water Absorption of Plastics
ASTM D 638	(2002) Tensile Properties of Plastics
ASTM D 751	(2000) Coated Fabrics

## 1.2 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures:"

## SD-03 Product Data

Elastomeric waterproofing sheet material; G-AE

Protection board

Primers, adhesives, and mastics

## SD-04 Samples

Corner and field condition

## SD-06 Test Reports

Elastomeric waterproofing sheet material

Certify compliance with performance requirements specified herein.

## SD-08 Manufacturer's Instructions

Material Safety Data Sheets for Primers, adhesives, and mastics

Submit Manufacturer's material safety data sheets for primers, adhesives and mastics.

## 1.3 QUALITY ASSURANCE

## 1.3.1 Shop Drawing Requirements

Include description and physical properties; termination details; application details; recommendations regarding shelf life, application procedures; requirements for protective covering; and precautions for flammability and toxicity.

## 1.4 DELIVERY, STORAGE, AND HANDLING

Deliver and store materials out of the weather, in manufacturer's original packaging with brand name and product identification clearly marked. Do not permit uncertified materials in the work area.

## 1.5 ENVIRONMENTAL CONDITIONS

Do not apply waterproofing during inclement weather or when there is ice, frost, surface moisture, or visible dampness on the surface to receive waterproofing and when ambient and surface temperatures are 40 degrees F or below.

## PART 2 PRODUCTS

## 2.1 MATERIALS

Provide one of the types of elastomeric waterproofing sheet material and related primers, adhesives, and mastics as specified herein. Ensure compatibility of waterproofing materials within a specific type, with each other, and with the materials on which they will be applied. Materials shall conform to the applicable performance requirements cited below when tested in accordance with the referenced ASTM publications.

## 2.2 THERMOPLASTIC MEMBRANE: POLYVINYL CHLORIDE (PVC)

Polyvinyl chloride (PVC) flexible sheets with non-woven fiberglass reinforcing not less than 60 mils minimum thickness.

## 2.2.1 Thermoplastic Membrane Performance Requirements

- a. Overall thickness, ASTM D 751:, .059 inches min.;

- b. Tensile strength ASTM D 638:, , 1600 psi min.;
- c. Elongation at break, ASTM D 638:, 250 percent minimum;
- d. Seam strength, ASTM D 638:, 90 percent minimum of tensile strength;
- e. Retention of properties after heat aging, ASTM D 3045;
- f. Tensile strength, ASTM D 638:, 95 percent of original;
- g. Elongation, ASTM D 638:, 95 percent of original;
- h. Tear resistance, ASTM D 1004:, , 17 Pound Force
- i. Low Temperature Bend , ASTM D 2136:, ; -40 F;
- j. Liner Dimensional Change, ASTM D 1204: 0.002 percent; and
- k. Weight Change After Immersion in Water, ASTM D 570:, 2.0 percent maximum.

#### 2.2.2 Adhesives

- a. Adhesive for thermoplastic flashings as recommended by manufacturer.
- b. Adhesive for Sub-Membrane Grid: 100% solids, two-part urethane, with minimum tensile strength of , 150 psi, in accordance with ASTM D 412 and adhesion to concrete of 12 ply in accordance with ASTM D 429 as recommended by manufacture.

#### 2.3 PROTECTION BOARD

Provide protection board that is compatible with the waterproofing membrane.

### PART 3 EXECUTION

#### 3.1 VERIFICATION OF CONDITIONS

Before starting the work, verify that surfaces to be waterproofed are in satisfactory condition. Notify the Contracting Officer of defects or conditions that will prevent a satisfactory application. Do not start application until defects and conditions have been corrected.

#### 3.2 AREAS TO RECEIVE WATERPROOFING

Apply waterproofing membrane materials on second level only in areas scheduled to receive ceramic tile finishes. These rooms include Room 222 Women's Toilet Room, Room 223 Men's Toilet Room, Room 253 Unisex Toilet Room and Room 254 Unisex Toilet Room.

#### 3.3 SURFACE PREPARATION

Ensure surfaces to be treated are clean, dry, smooth, and free from deleterious materials and projections. Thoroughly wet holes, joints, cracks, and voids in concrete with water and fill with Portland cement

mortar, strike flush, and permit to dry. Cut off high spots or grind smooth. Sweep surfaces to be covered before applying waterproofing to remove dust and foreign matter. Cure concrete by a method compatible with the waterproofing system.

### 3.4 APPLICATION

Follow manufacturer's printed installation instructions. When using solvent welding liquid, avoid prolonged contact with skin and breathing of vapor. Provide adequate ventilation. Carry waterproofing of horizontal surfaces up abutting vertical surfaces as indicated and adhere solid to the substrate. Avoid wrinkles and buckles in applying membrane and joint reinforcement.

- a. Non-Self-Adhering Membrane: Unroll membrane and allow to remain flat for at least one-half hour before application. Apply an asphalt concrete primer prior to application of asphaltic adhesive. Where solvent adhesive is applied, allow major portion of solvent to evaporate so that bonding adhesive does not stick to a dry finger touching it. Apply elastomeric waterproofing membrane in a full bed of adhesive at a uniform coverage rate in accordance with the recommendations in the membrane manufacturer's printed instructions. Pull membrane tight without stretching. As soon as adhesive is fully set and dry, recheck lap splices. Where openings or fishmouths appear, reseal and reroll lap splices.
- b. Self-Adhering Membrane: Apply composite, self-adhering membrane on surfaces primed at a uniform coverage rate in accordance with membrane manufacturer's printed instructions. Remove release sheet and apply with tacky surface in contact with dried primer.
- c. Protection: Protect membrane over horizontal surfaces from abnormal traffic during installation. Use only equipment with rubber tires. Provide walkway protection where heavy traffic from other trades is expected. Do not store material on membrane.

#### 3.4.1 Thermoplastic Membrane (PVC)

Deck shall be clean, smooth and dry without surface irregularities. Consult with membrane manufacturer prior to grid application. Install 12 inches wide sub-membrane containment grid as required by manufacturer. Provide and install the containment grid at intervals across the width and length of the substrate, at the base of all transitions, walls, curbs, penetrations, and at the perimeter of each deck/substrate section. Fully adhere strips to the deck in a full bedding of two-part urethane adhesive medium. Adjacent sheets shall be welded in accordance with manufacturer's instructions. All side and end lap joints shall be hot-air welded. Lap area shall be a minimum of 3 inch wide when machine welding, and a minimum of 4 inch wide when hand welding but not less than recommended by the manufacturer. Overlaps shall be with the flow of water.

#### 3.4.2 Composite, Self-Adhering Membrane

Lap sheets at edges and ends a minimum of 2 1/2 inches over the preceding sheet. All side laps shall be minimum 2 1/2 inches and end laps shall be 5 inches. Laps shall be self adhesive, mastic as per manufacturer's recommendation. Roll or firmly press to adhere membrane to substrate. Cover corners and joints with two layers of reinforcement by first applying a 12 inch width of membrane centered along the axis. Flash drains and

projections with a second ply of membrane for a distance of 6 inches from the drain or projection. Finish exposed, terminated edges of membrane on horizontal or vertical surfaces with a trowelled bead of mastic. Apply mastic around edges of membrane, and drains and projections. Apply mastic at end of each work day.

### 3.5 FLASHING

Flash penetrations through membrane. Ensure that where reinforcing bars penetrate a waterproofing membrane, each of those penetrations be sealed with the appropriate sealant or mastic flashing component. Embed elastomeric membrane in a heavy coat of adhesive, except for self-adhering membrane.

### 3.6 FIELD QUALITY CONTROL

Notify the Contracting Officer one day prior to date of performing tests. Before concealment, cover elastomeric waterproofing on horizontal surfaces over finished spaces with 3 inches of ponded water for 24 hours. Do not add water after start of 24 hour period. Carefully measure water level at beginning and end of 24 hour period. If water level falls, remove water and inspect waterproofing membrane. Make repairs or replacement as directed, and repeat test. Do not proceed with work that conceals membrane waterproofing before receiving approval and acceptance of Contracting Officer.

### 3.7 PROTECTIVE COVERING

After installation has been inspected and approved by the Contracting Officer, apply a protective covering to the membrane waterproofing prior to backfilling. Protect vertical membrane waterproofing with a 1/2 inch minimum thickness of asphalt plank; 1/2 inch minimum thickness of fiberboard; or 1/8 inch minimum thickness of compatible water-resistant protection board with edges abutting adjacent edges and exposed surfaces covered by a taping system recommended by manufacturer of protection board. Cover horizontal membrane waterproofing with similar protection board and Portland cement mortar not less than 3/4 inch thick; place uniformly and allow to set before installing subsequent construction.

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## SECTION 07212N

## MINERAL FIBER BLANKET INSULATION

09/99

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

- |            |  |
|------------|--|
| ASTM C 665 | (2001e1) Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing  |
| ASTM C 930 | (1992) Potential Health and Safety Concerns Associated with Thermal Insulation Materials and Accessories |
| ASTM E 136 | (1996; Rev. A) Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C                         |

## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

- |                 |                        |
|-----------------|------------------------|
| 29 CFR 1910.134 | Respiratory Protection |
|-----------------|------------------------|

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- |          |   |
|----------|---|
| NFPA 54  | (2002) National Fuel Gas Code   |
| NFPA 211 | (2003) Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances |

## 1.2 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

## SD-03 Product Data

Blanket insulation

Accessories

## SD-08 Manufacturer's Instructions

Insulation



### 1.3 DELIVERY, STORAGE, AND HANDLING

#### 1.3.1 Delivery

Deliver materials to site in original sealed wrapping bearing manufacturer's name and brand designation, specification number, type, grade, R-value, and class. Store and handle to protect from damage. Do not allow insulation materials to become wet, soiled, crushed, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storing, and protecting of materials before and during installation.

#### 1.3.2 Storage

Inspect materials delivered to the site for damage; unload and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling.

### 1.4 SAFETY PRECAUTIONS

#### 1.4.1 Respirators

Provide installers with dust/mist respirators, training in their use, and protective clothing, all approved by National Institute for Occupational Safety and Health (NIOSH)/Mine Safety and Health Administration (MSHA) in accordance with 29 CFR 1910.134.

#### 1.4.2 Smoking

Do not smoke during installation of blanket thermal insulation.

#### 1.4.3 Other Safety Concerns

Consider other safety concerns and measures as outlined in ASTM C 930.

## PART 2 PRODUCTS

### 2.1 BLANKET INSULATION

ASTM C 665, Type I, blankets without membrane coverings.

#### 2.1.1 Thermal Resistance Value (R-VALUE)

As indicated

#### 2.1.2 Recycled Materials

Provide Thermal Insulation containing recycled materials to the extent practicable, provided the material meets all other requirements of this section. The minimum required recycled materials content by weight are:

Rock Wool: 75 percent slag  
Fiberglass: 20 to 25 percent glass cullet

#### 2.1.3 Prohibited Materials

Do not provide asbestos-containing materials.

## 2.2 BLOCKING

Wood, metal, unfaced mineral fiber blankets in accordance with ASTM C 665, Type I, or other approved materials. Use only non-combustible materials meeting the requirements of ASTM E 136 for blocking around heat producing devices.

## 2.3 ACCESSORIES

### 2.3.1 Adhesive

As recommended by the insulation manufacturer.

### 2.3.2 Mechanical Fasteners

Corrosion resistant fasteners as recommended by the insulation manufacturer.

### 2.3.3 Wire Mesh

Corrosion resistant and as recommended by the insulation manufacturer.

## PART 3 EXECUTION

### 3.1 EXISTING CONDITIONS

Before installing insulation, ensure that areas that will be in contact with the insulation are dry and free of projections which could cause voids or compressed insulation. If moisture or other conditions are found that do not allow the workmanlike installation of the insulation, do not proceed but notify Contracting Officer of such conditions.

### 3.2 PREPARATION

#### 3.2.1 Blocking Around Heat Producing Devices

Install non-combustible blocking around heat producing devices to provide the following clearances:

- a. Vents and vent connectors used for venting the products of combustion, flues, and chimneys other than masonry chimneys: Minimum clearances as required by NFPA 211.
- b. Gas Fired Appliances: Clearances as required in NFPA 54.

Blocking around flues is not required when insulation blanket, including any attached vapor retarder, passed ASTM E 136, in addition to meeting all other requirements stipulated in Part 2.

### 3.3 INSTALLATION

#### 3.3.1 Insulation

Install and handle insulation in accordance with manufacturer's

instructions. Keep material dry and free of extraneous materials. Ensure personal protective clothing and respiratory equipment is used as required. Observe safe work practices.

#### 3.3.1.1 Electrical wiring

Do not install insulation in a manner that would sandwich electrical wiring between two layers of insulation.

#### 3.3.1.2 Continuity of Insulation

Install blanket insulation to butt tightly against adjoining blankets and to studs, sill plates, headers and any obstructions. Provide continuity and integrity of insulation at corners, wall to ceiling joints and floor. Avoid creating thermal bridges.

#### 3.3.1.3 Installation at Bridging and Cross Bracing

Insulate at bridging and cross bracing by splitting blanket vertically at center and packing one half into each opening. Butt insulation at bridging and cross bracing; fill in bridged area with loose or scrap insulation.

#### 3.3.1.4 Cold Climate Requirement

Place insulation to the outside of pipes.

#### 3.3.1.5 Sizing of Blankets

Provide only full width blankets when insulating between framing. Size width of blankets for a snug fit where studs are irregularly spaced.

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## SECTION 07410

## COMPOSITE ALUMINUM WALL PANEL SYSTEM

## PART 1 GENERAL

## 1.1 REFERENCE

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7 (2002) Minimum Design Loads for Buildings and Other Structures

## ASTM INTERNATIONAL (ASTM)

ASTM B 117 (1997) Operating Salt Spray (Fog) Apparatus

ASTM B 209 (2002a) Aluminum and Aluminum-Alloy Sheet and Plate

ASTM B 221 (2002) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

ASTM C 297 (1994; R 1999) Flatwise Tensile Strength of Sandwich Constructions

ASTM C 578 (2001) Rigid, Cellular Polystyrene Thermal Insulation

ASTM D 1037 (1999) Evaluating Properties of Wood-Base Fiber and Particle Panel Materials

ASTM D 1308 (2002) Effect of Household Chemicals on Clear and Pigmented Organic Finishes

ASTM D 1654 (1992; R 2000) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments

ASTM D 1781 (1976 R 1986) Climbing Drum Peel Test for Adhesives

ASTM E 84 (2001) Surface Burning Characteristics of Building Materials

ASTM D 2244 (2002) Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

ASTM D 2247 (2002) Testing Water Resistance of

## Coatings in 100% Relative Humidity

ASTM D 2794	(1993; R 1999e1) Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D 3359	(2002) Measuring Adhesion by Tape Test
ASTM D 4214	(1998) Evaluating the Degree of Chalking of Exterior Paint Films
ASTM D 523	(1989; R 1999) Specular Gloss
ASTM D 714	(2002) Evaluating Degree of Blistering of Paints
ASTM D 822	(2001) Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings
ASTM D 968	(1993; R 2001) Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D 4145	(1983; W/ Rev) Standard Test Method For Coating Flexibility Of Prepainted Sheet
ASTM E 108	(1990) Fire Tests for Roof Coverings
ASTM E 283	(1991; R 1999) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E 330	(2002) Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E 331	(2000) Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

## INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2003) International Building Code
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## INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO)

UBC 26-9	Evaluation of Flammability Characteristics of Exterior Non load-Bearing Wall Assemblies Containing Combustible Components using Intermediate-Scale, Multistory Test Apparatus Title
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## UNDERWRITERS LABORATORIES (UL)

UL 1715	(1997) Fire Test Of Interior Finish Material
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## 1.2 SYSTEM DESCRIPTION

Fabricated dry joint, gasketed extrusion, wall panel system: Aluminum faced composite panels with integral reveals, integral joinery and a panel mounting system that includes anchorages, shims, furring, fasteners, gaskets and sealants, related flashing, and adapters for a complete pressure equalized rain screen installation which satisfy all appropriate requirements contained herein and have been verified by load testing and independent design analysis to meet the specified design requirements. System shall include roof edge, soffits, and similar border and filler items as integral components of the panel system. Composite wall panel material shall be one of the following:

- a. Factory-formed Injection Molded Panels: Two sheets of aluminum with a thermo set, polymeric core formed via reaction injection molding process with no glues or adhesives between dissimilar materials.
- b. Factory-fabricated Composite Metal Panels: Two sheets of aluminum bonded to a thermoplastic core, factory-fabricated into panels with factory-applied aluminum extrusion dryset system.

Engineering, manufacturing and installation of the wall panel units and extruded aluminum trim related to the wall system and its intersection with adjacent materials shall be supplied by a single manufacturer and certified wall systems contractor.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having an "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-02 Shop Drawings

#### Materials; G-AE

Submit shop drawings showing adaption of the manufacturer's system to the project; include typical unit elevations at 1/2" scale and details at 3" scale, or full scale, to show dimensioning, member profiles, jointing, panels, types and thickness of metal, flashing details, field connections, weep and drainage system, finishes, anchorage system and interface with building construction. Show clearly where and how the manufacturer's system deviates from contract drawings and these specifications.

### SD-03 Product Data

#### Materials; G-AE

Submit manufacturer's descriptive literature, specifications for materials and fabrication of panel system, and performance test data.

#### Insulation

The manufacturer's descriptive data shall be submitted for each type and

thickness of insulation used. This data shall include a facsimile of the label the manufacturer shall apply to the insulation for shipping to the site. This label shall include a clearly marked indication of the R-value of each board thickness.

#### Design Analysis; G-AE

Design analysis for panel system signed by a Registered Professional Engineer employed by the system manufacturer. The design analysis shall include a list of the design loads, and complete calculations for the support system and shall indicate how expected thermal movements are accommodated.

#### SD-04 Samples

##### Materials; G-AE

Submit a sample of panel system with specified finish, complete with factory applied edge treatment. Fabricate into units showing the following:

- Prime members
- Joinery
- Anchorage
- Profiles
- Intersections
- Panel Stiffeners

#### SD-06 Test Reports

##### System Performance Requirements

Certified test reports showing compliance with test methods indicated.

#### SD-07 Certificates

##### Materials

Certificates stating that the composite aluminum wall panel system complies with the requirements of this section.

### 1.4 QUALITY ASSURANCE

#### 1.4.1 System Characteristics

Plans, elevations, details, characteristics and other requirements indicated are based upon standards by one manufacturer. It is intended that other manufacturers may be acceptable, provided their details and characteristics comply with the requirements of size and profiles, and material/performance standards as indicated and as follows:

#### 1.4.2 Appearance

System must not generally have any visible fasteners, telegraphing of fasteners or assembly on the panel faces or any other compromise of a neat, flat, fastener free panel and joint appearance.

#### 1.4.3 Composition

System must be essentially the same composition and identically the finish

of that specified.

#### 1.4.4 Manufacturer's Qualifications

Manufacturers of components of the factory-fabricated composite panel system shall have not less than five (5) years experience in the manufacture of each component.

#### 1.4.5 Installer Qualifications

Panel system Fabricator/Installer shall have a minimum of five (5) years experience in the fabrication and erection of panel systems similar to systems required for this project. Fabricator/Installer must be acceptable to the Panel Manufacturer and provide certification of same.

#### 1.4.6 Sample Panels

After material samples are approved and prior to starting panel work, install wall panel mockup to sample masonry panels as specified in Section 04200 MASONRY. In addition to masonry work and rubberized wall membrane, panels shall demonstrate installation of wall panel system including typical four-panel intersection, factory-assembled three-sided corner unit, and factory color finish trim, complete with panel mounting system and insulation.

### 1.5 SYSTEM PERFORMANCE REQUIREMENTS

#### 1.5.1 Testing

Where manufacturer's systems and components have been tested in accordance with tests specified under this Article, provide certification by manufacturer showing compliance with requirements. Otherwise, perform tests through a laboratory approved by the government and provide certified test results. Test results shall meet or exceed indicated standards.

#### 1.5.2 Wind Resistance

Provide manufacturer's system which has been designed and tested in accordance with ASTM E 330 to withstand flexural, shear and torsional stresses for component and cladding wind loads shown on drawings as determined by ASCE 7 but in no case less than 40 pounds per square foot positive and negative.

#### 1.5.3 Deflections and Thermal Movement

Provide manufacturer's products and system which are capable of withstanding building movements and weather exposures including wind loading, and which are capable of performing within the following limitations:

- a. Normal to the Plane of the Wall: Deflection of perimeter framing member shall not exceed  $1/175$  of span or  $3/4$ ", whichever is less.
- b. Maximum allowable deflection of panel stiffeners and aluminum composite panel material shall not exceed  $1/60$  of span.
- c. At connection points of framing members to anchors, anchor deflection in any direction shall not exceed  $1/16$ ". Where connection points are not clearly defined, maximum anchor

deflection shall not exceed 1/16".

- d. Thermal Movements: Make allowances for free vertical and horizontal thermal movements due to the contraction and expansion of component parts. For an ambient temperature range from plus 20 degrees F to plus 180 degrees F, buckling, opening of joints, undue stress on fasteners, failure of sealants or any other detrimental effect due to the thermal movement of component parts will not be permitted. Fabrication, assembly and erection procedure shall take into account the ambient temperature range at the time of the respective operation.

#### 1.5.4 Leakage Resistance

Provide the manufacturer's system that has been tested to demonstrate permanent resistance to leakages as follows:

- a. Air Infiltration: Design panels used in pressure equalized rain screen applications to allow air to vent the cavity behind the outer panel/rain screen. Rain screen panel components, therefore, have no air infiltration resistance.
- b. Water Penetration: Water penetration in this specification is defined as the appearance of uncontrolled water in the wall. Provision shall be made in the design to drain to the exterior face of the wall any leakage of water occurring at joints and/or any condensation taking place within the construction. No water infiltration under static pressure with ASTM E 331 at a differential of 20 percent of design loading, 12 psf minimum. Horizontal joint shall demonstrate effective rain screen pressure equalization performance by allowing no water infiltration with the liner side seal broken when tested in accordance with ASTM E 331 at 12 psf.

#### 1.5.5 Structural Performance

Shall be tested in accordance with ASTM E 330 at design pressure. No permanent deformation or failures of structural members shall occur.

#### 1.5.6 Panel Flatness Criteria

Maximum 1/32" in 2'-0" on panel in any direction for assembled units (non-accumulative).

#### 1.5.7 Bond Integrity

##### 1.5.7.1 Factory Formed Injection Molded Panel

When tested in accordance with ASTM C 297, bond strength shall be a minimum 450 psi.

##### 1.5.7.2 Factory Fabricated Composite Metal Panel

When tested in accordance with ASTM D 1781-76 for bond integrity, simulating resistance to delamination:

Bond Strength: 220 psi minimum

Peel Strength: 26 in. lbs./in., minimum

Shall have successfully passed 6 each ASTM D 1037 weather cycling

tests.

Shall have no change in bond performance after 8 hours of submersion in boiling water.

#### 1.5.8 Fire Performance Characteristics

Wall panel system shall comply with requirements for finished panel performance as established by Section 1407 of the International Building Code (ICC IBC) for non-load bearing, non-combustible wall construction. Finish panel system shall have surface burning characteristics of a flame spread rating of 25 or less and a smoke developed rating of 450 or less when tested in accordance with ASTM E 84; system evaluated and passed the UBC 26-9, intermediate scale multi-story test (ISMA) for flammability characteristics of exterior non-load bearing wall panel disassemblies. Components for interior building construction shall comply with UL 1715.

#### 1.6 DELIVERY AND STORAGE

Deliver fabricated units and components parts identified per erection drawings. Protect surfaces from damage during shipping and erection. Inspect work for damage upon delivery. No damaged material shall be erected. Coordinate with Contractor for storage space at the site.

#### 1.7 MANUFACTURER'S MATERIAL WARRANTY

The Contractor shall furnish, in writing, a manufacturer's 20 year exterior and interior material finish warranty on the factory colored finish warranting that the finish, under normal atmospheric conditions at the site, will not crack, peel, or delaminate; chalk in excess of a numerical rating of eight, as determined by ASTM D 2244; or change color in excess of five CIE or Hunter Lab color difference (delta E) units in accordance with ASTM D 2244. Liability under this warranty is exclusively limited to refinishing with an air-drying version of the specified finish or replacing the defective coated material.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

##### 2.1.1 Composite Panels

Aluminum faced composite panel material shall be one of the following:

##### 2.1.1.1 Factory-formed Injection Molded Panels

Two sheets of 0.032 inch thick aluminum with a thermo set, polymeric core, formed via a reaction injection molding process with no glues or adhesives between dissimilar materials. Total Composite Thickness shall be 8 millimeters.

##### 2.1.1.2 Factory-fabricated Composite Metal Panels

Thermoplastic material core which in composite assembly meets performance characteristics specified. Face sheets of .020 inch aluminum 3003 alloy, coil coated with specified high performance finish and chemically bonded in a continuous process to core material to meet performance requirements; no glued or laminated materials allowed. Total composite thickness of 4 millimeters.

### 2.1.2 Panel Mounting System

Provide members such as extrusions, formed members, sheet and plate, of the alloy, temper and thickness recommended by the manufacturer to comply with the requirements of ASTM B 221 for extrusions and ASTM B 209 for sheet or plate. System to be dry joint, gasketed extrusion, pressure equalized rain screen wall panel.

### 2.1.3 Trim and Flashing

Extrusion material shall be 6063, T-5 aluminum, 1/16 inch minimum thickness for trim pieces and 3/32 inch thick minimum for structural elements. Provide proprietary aluminum extrusions to manufacturer's standard, tested profiles. Where exposed to view, finish to match adjacent panel system. Provide lap strip under flashing at abutted conditions with lapped surface sealed with a full bed of non-hardening sealant. For plate and sheet aluminum, provide alloy and temper recommended by aluminum producer or finisher for type of use and finish indicated, and with not less than the strength and durability properties of ASTM B 209, alloy 6061, T-5, thickness as indicated.

### 2.1.4 Gaskets and Sealants

Gaskets shall be black, fire retardant EPDM or neoprene. Sealants shall be as recommended by the system manufacturer.

### 2.1.5 Furring and Fasteners

Zee furring and hat type furring channels where indicated of G-90 galvanized steel, size and thickness as determined by the panel manufacturer for indicated applications, except that furring shall be minimum 16 gauge. Fasteners as recommended by panel manufacturer of aluminum, non-magnetic stainless steel or other materials warranted by manufacturer to be non-corrosive and compatible with aluminum panel system.

## 2.2 FABRICATION

Fabricate panel system to dimensions, sizes and profiles indicated on the drawings based on an assumed design temperature of 70 degrees F. Allow for ambient temperature range of time of fabrication and erection. Where possible, check actual field dimensions in construction work by accurate field measurement before fabrication, and show recorded measurements on final shop drawings. However, coordinate fabrication schedule with construction progress to avoid delay of work. Where necessary, proceed with fabrication without field dimensions and coordinate installation tolerances to ensure proper fit of all system components. Shop fabricate units ready for erection. For factory-fabricated composite metal panels, fabricate panel sections with envelope pan corners with metal backup plates and sealant inside corner folds. At curved panels, heat weld compound corners with polyethylene rod, reinforced, and provide hair line joints. Provide stiffeners of manufacturer's standard design, material, size and location bonded to rear face of panels to maintain flatness within specified tolerances. Factory-fabricate aluminum coping from plate or sheet, thickness as indicated on drawings, to profiles indicated on drawings. Provide welded corners where flat planes intersect with curved surfaces and grind smooth and finish to receive factory color finish.

### 2.2.1 Extrusion Clips for Panel Attachment

Factory-formed injection molded panels shall have a factory formed horizontal joint; vertical joints shall have formed returns with continuous gasket and aluminum extrusion receptors. Custom panels, where required, shall have route and return construction for the full perimeter with manufacturer's proprietary, mechanically attached, extruded aluminum receptors and gaskets continuous. Edge grip extrusions are not permitted.

Factor-fabricated composite metal panels shall have manufacturer's proprietary, mechanically attached extrusions full length around panel perimeter for panel reinforcement and alignment. Intermittent clips and edge grip extrusion are not permitted.

## 2.3 FACTORY COLOR FINISH

Panels and exposed flashing shall have a factory applied polyvinylidene fluoride finish on the exposed side. The exterior finish shall consist of a baked-on topcoat with an appropriate prime coat. Color shall match the color indicated in Section 09915 COLOR SCHEDULE. The exterior coating shall be a nominal 1 mil thickness consisting of a topcoat of not less than 0.7 mil dry film thickness and the paint manufacturer's recommended primer of not less than 0.2 mil thickness. The interior color finish shall consist of a 0.2 mil thick prime coat. The exterior color finish shall meet the test requirements specified below.

### 2.3.1 Salt Spray Test

A sample of the sheets shall withstand a cyclic corrosion test for a minimum of 1000 hours in accordance with ASTM B 117, including the scribe requirement in the test. Immediately upon removal of the panel from the test, the coating shall receive a rating of not less than 10, no blistering, as determined by ASTM D 714; and a rating of 10, no blistering or cracking, as determined by ASTM D 1654.

### 2.3.2 Formability Test

When subjected to testing in accordance with ASTM D 4145, the coating film shall show no evidence of cracking or tape removal of film at 2-T bend.

### 2.3.3 Accelerated Weathering, Chalking Resistance and Color Change

A sample of the sheets shall be tested in accordance with ASTM D 822, for 5000 total hours. The coating shall withstand the weathering test without objectionable chalking, color change or loss of adhesion of the protective coating, or corrosion of the base metal. Protective coating with no removal of finish after 1/16-inch cross-hatching to bare metal, to impact limits or point of metal rupture when tested in accordance with ASTM D 3359, Test Method B. Following the accelerated weathering test, the coating shall have a chalk rating not less than No. 8 in accordance with ASTM D 4214 test procedures, and the color change shall not exceed 5 CIE or Hunter Lab color difference (delta E) units in accordance with ASTM D 2244. For sheets required to have a low gloss finish, the chalk rating shall be not less than No. 6 and the color difference shall be not greater than 7 units.

### 2.3.4 Humidity Test

When subjected to a humidity cabinet test in accordance with ASTM D 2247 for 1000 hours, a scored panel shall show none or few #8 blisters.

### 2.3.5 Impact Resistance

Factory-painted sheet shall withstand direct and reverse impact in accordance with ASTM D 2794, impact, equal to 2000 times the metal thickness expressed in inch-pounds, with no cracking or adhesion loss.

### 2.3.6 Abrasion Resistance Test

When subjected to the falling sand test in accordance with ASTM D 968, Method A, the coating system shall withstand a minimum of 50 liters of sand before the appearance of the base metal. The term "appearance of base metal" refers to the metallic coating on steel or the aluminum base metal.

### 2.3.7 Specular Gloss

Finished surfaces shall have a specular gloss value of 30 plus or minus 5 or less at an angle of 60 degrees when measured in accordance with ASTM D 523.

### 2.3.8 Pollution Resistance

Coating shall show no visual effects when covered spot tested in a 10 percent hydrochloric acid solution for 15 minutes in accordance with ASTM D 1308.

## 2.4 INSULATION

### 2.4.1 Rigid Board-Type Insulation

Rigid board-type insulation shall be extruded polystyrene. Polystyrene shall conform to ASTM C 578. The insulation shall be a standard product and shall be marked with not less than the manufacturer's trademark or name, the specification number, the permeance and R-values.

#### 2.4.1.1 Aged R-Value

The aged R-value shall be determined at 75 degrees F in accordance with the appropriate referenced specification. The stated R-value of the insulation shall be certified by an independent testing laboratory or certified by an independent Registered Professional Engineer if tests are conducted in the manufacturer's laboratory.

#### 2.4.1.2 Insulation Thickness

The insulation thickness shall be as shown on the drawings.

### 2.4.2 Insulation Adhesive

Insulation adhesive shall be specifically prepared to adhere the insulation to the sheathing. The adhesive shall not deleteriously affect the insulation, and shall have a record of satisfactory and proven performance for the conditions under which to be used.



## PART 3 EXECUTION

### 3.1 INSTALLATION

#### 3.1.1 Preparation

Examine supporting structure, air barrier and conditions under which the work is to be erected, and notify the Contractor in writing of conditions detrimental to proper and timely completion of the work. Do not proceed with erection until unsatisfactory conditions have been corrected.

#### 3.2 GENERAL

Do not install component parts which are observed to be defective, including warped, bowed, dented, abraided and broken members. Do not cut, trim, weld, or braze component parts during erection in a manner which would damage finish, decrease strength, or result in a visual imperfection or a failure in performance. Return component parts which require alteration to shop for refabrication, if possible, or for replacement by new parts. Install panels plumb, true, level and in alignment in accordance with manufacturer's instructions.

##### 3.2.1 Metal Separation

Apply a coat of bituminous paint, concealed, on one or both surfaces wherever dissimilar metals would otherwise be in contact. Use gasketed fasteners where needed to eliminate the possibility of corrosive or electrolytic action between metals.

##### 3.2.2 Anchorage

Anchor component parts of the system securely in place, providing for necessary thermal and structural movement. Provide pressure-treated solid wood blocking behind aluminum panels where needed or indicated. Use concealed fastenings only.

##### 3.2.3 Tolerances and Shimming

Provide adjustment within system to accommodate variations of existing structure. Deviation from established vertical, horizontal or designed position must not exceed 1/8" per 12' of length of any member or 1/4" in any total run in any line. All shimming required to meet installation tolerances shall be provided and installed by composite aluminum wall panel installer.

##### 3.2.4 Insulation

Composite aluminum wall panel system shall be insulated, where shown, by installing board-type insulation. Board type insulation shall be applied directly to the sheathing, or rubberized wall membrane where indicated, with adhesive. Insulation shall be neatly fitted between obstructions without impaling of insulation on anchors. The insulation shall be applied in parallel courses with vertical joints breaking midway over the course below and shall be applied in moderate contact with adjoining units without forcing, and shall be cut to fit neatly against adjoining surfaces.

##### 3.2.5 Color Grain

The color grain in the polyvinylidene fluoride finish shall run in the same

direction on all composite metal panels used on the project.

#### 3.2.6 CLEANING

Clean aluminum surfaces promptly after installation, exercising care to avoid damage to protective coatings and finishes. Remove excess sealants, dirt and other substances. Remove protective film as installation proceeds. It is the responsibility of the Contractor to initiate and maintain protections and other precautions required to ensure that panel system will be without damage or deterioration (other than normal weathering) at time of final acceptance.

-- End of Section --

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## SECTION 07416A

STRUCTURAL STANDING SEAM METAL ROOF (SSSMR) SYSTEM  
11/01

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI SG-973 (1996) Cold-Formed Steel Design Manual

## ASTM INTERNATIONAL (ASTM)

ASTM A 792/A 792M (2002) Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process

ASTM B 117 (1997) Operating Salt Spray (Fog) Apparatus

ASTM C 1177/C 1177M (2001) Glass Mat Gypsum Substrate for Use as Sheathing

ASTM C 1289 (2002) Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board

ASTM C 518 (1998) Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

ASTM C 665 (2001e1) Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing

ASTM D 1308 (2002) Effect of Household Chemicals on Clear and Pigmented Organic Finishes

ASTM D 1654 (1992; R 2000) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments

ASTM D 1970 (2001) Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection

ASTM D 2244 (2002) Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

ASTM D 2247 (2002) Testing Water Resistance of Coatings in 100% Relative Humidity

ASTM D 2582	(2003) Standard Test Method For Puncture-Propagation Tear Resistance Of Plastic Film And Thin Sheeting
ASTM D 2794	(1993; R 1999e1) Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D 3359	(2002) Measuring Adhesion by Tape Test
ASTM D 3776	(1996) Mass Per Unit Area (Weight) of Fabric
ASTM D 412	(1998a) Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
ASTM D 4214	(1998) Evaluating the Degree of Chalking of Exterior Paint Films
ASTM D 522	(1993a; R 2001) Mandrel Bend Test of Attached Organic Coatings
ASTM D 523	(1989; R 1999) Specular Gloss
ASTM D 610	(1995) Evaluating Degree of Rusting on Painted Steel Surfaces
ASTM D 714	(2002) Evaluating Degree of Blistering of Paints
ASTM D 822	(2001) Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings
ASTM D 882	(2002) Tensile Properties of Thin Plastic Sheeting
ASTM D 903	(1998) Peel or Stripping Strength of Adhesive Bonds
ASTM D 968	(1993; R 2001) Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM E 1592	(2001) Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
ASTM E 84	(2001) Surface Burning Characteristics of Building Materials
ASTM E 96	(2000e1) Water Vapor Transmission of Materials

## AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7	(2002) Minimum Design Loads for Buildings and Other Structures
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## APA - THE ENGINEERED WOOD ASSOCIATION (APA)

APA E445R (1980; Rev Jan 1996) Performance Standards  
and Policies for Structural-Use Panels

## U.S. DEPARTMENT OF COMMERCE (DOC)

PS1 (1995) Construction and Industrial Plywood  
(APA V995)

PS2 (1992) Wood-Based Structural-Use Panels  
(APA 5350)

## 1.2 GENERAL REQUIREMENTS

The Contractor shall furnish a commercially available roofing system which satisfies all requirements contained herein and has been verified by load testing and independent design analysis to meet the specified design requirements.

## 1.2.1 Structural Standing Seam Metal Roof (SSSMR) System

The SSSMR system covered under this specification shall include the entire roofing system; the standing seam metal roof panels, fasteners, connectors, roof securement components, and assemblies tested and approved in accordance with ASTM E 1592. In addition, the system shall consist of panel finishes, slip sheet, insulation, vapor retarder, sheathing underlayment, all accessories, components, and trim and all connections with roof panels. This includes roof penetration items such as vents, eaves, ridge, or other roof system flashings installed and specified within this contract to provide a weathertight roof system. Panel profiles shall be of the symmetrical pan with either a locked seam produced with a field operated roll-forming tool or a separate field crimped sealing cap type. Curved panels shall be mechanically curved to the exact radius of the covering surface. All metal panels must be factory pre-manufactured and engineered except panels in excess of shippable length. Panels in excess of shippable length shall be formed on site using heavy duty factory type rollformers of a type that gradually produce a finished panel profile using at least twelve forming stations. Tooling shall be maintained clean and in good working condition. Tooling repairs made in the field by means of welding, sawing, grinding, or the like are unacceptable. Trained and experienced technicians shall operate site rollforming equipment. Field formed panel profiles and characteristics shall be identical to factory formed panel profiles. Seam caps shall be pre-manufactured and have sealant applied in the factory. Field splicing of caps sections is acceptable where the total seam to be covered must be of a length in excess of shippable length. One manufacturer shall provide all components of the SSSMRS except that where a products necessary for a complete installation is not available directly from the "primary" manufacturer it may be supplied by another manufacturer with the primary manufacturer's written approval. The snow guard system shall be completely compatible with the system provided and have no deleterious effects on performance or warranty.

## 1.2.2 Manufacturer

The SSSMR system shall be the product of a manufacturer who has been in the practice of manufacturing and designing SSSMR systems for a period of not less than 5 years and has been involved in at least five projects similar

in size and complexity to this project. The manufacturer shall have a representative on site for 20% of the actual installation process.

#### 1.2.3 Installer

The installer shall be certified by the SSSMR system manufacturer to have experience in installing at least three projects that are of comparable size, scope and complexity as this project for the particular roof system furnished. The installer may be either employed by the manufacturer or be an independent installer. Installer qualifications shall be certified in writing by the manufacturer as an approved installer of the system being supplied. In addition, the supervising staff person for the installer shall also be specifically certified by the manufacturer for the system being supplied with a manufacturers description of the type of supervision required.

#### 1.2.4 Moisture Vapor Control System

The moisture vapor control system for the roofing assembly using an SSSMR system shall be of the materials and installation indicated herein. The moisture vapor control system is critical to the success of the SSSMR system and shall receive appropriate attention throughout the installation process.

#### 1.2.5 CONSTRUCTION OBSERVATION AND TESTING

The Contractor will retain the services of an independent agency for roof and moisture vapor control system testing and construction observation. Notify Contractor's construction observer whenever work is to be done in sufficient time to arrange construction observation. Work shall include:

1. Full-time construction observation the first two weeks of roofing construction.
2. Periodic construction observation consisting of one two-day visit per week, including travel, thereafter for the duration of the roofing work.
3. One pre-construction meeting on-site.
4. One punch-list development site visit.

### 1.3 DESIGN REQUIREMENTS

The design of the SSSMR system shall be provided by the Contractor as a complete system. Members and connections not indicated on the drawings shall be designed by the Contractor. Roof panels, components, transitions, accessories, and assemblies shall be supplied by the same roofing system manufacturer.

#### 1.3.1 Design Criteria

Design criteria shall be in accordance with ASCE 7.

#### 1.3.2 Dead Loads

The dead load shall be the weight of the SSSMR system. Collateral loads such as sprinklers, mechanical and electrical systems, and ceilings shall not be attached to the panels.



### 1.3.3 Live Loads

#### 1.3.3.1 Concentrated Loads

The panels and anchor clips shall be capable of supporting a 300 pound concentrated load. The concentrated load shall be applied at the panel midspan and will be resisted by a single standing seam metal roof panel assumed to be acting as a beam. The undeformed shape of the panel shall be used to determine the section properties.

#### 1.3.3.2 Uniform Loads

The panels and concealed anchor clips shall be capable of supporting a minimum uniform gravity load of 30 psf and also resist loads shown on drawings.

#### 1.3.4 Roof Snow Loads

The design roof snow loads shall be as shown on the contract drawings.

#### 1.3.5 Wind Loads

The design wind uplift pressure for each roof system shall be as shown on the contract drawings. The design uplift force for each connection assembly shall be that pressure given for the area under consideration, multiplied by the tributary load area of the connection assembly. The safety factor listed below shall be applied to the design force and compared against the ultimate capacity. Prying shall be considered when figuring fastener design loads.

- a. Single fastener in each connection.....3.0
- b. Two or more fasteners in each connection...2.25

#### 1.3.6 Thermal Loads

Roof panels shall be free to move in response to the expansion and contraction forces resulting from a total temperature range of 220 degrees F during the life of the structure.

#### 1.3.7 Framing Members Supporting the SSSMR System

Any additions/revisions to framing members supporting the SSSMR system to accommodate the manufacturer/fabricator's design shall be the Contractor's responsibility and shall be submitted for review and approval. New or revised framing members and their connections shall be designed in accordance with AISI SG-973 Cold-Formed Manual.. Maximum deflection under applied live load, snow, or wind load shall not exceed 1/180 of the span length.

#### 1.3.8 Roof Panels Design

Steel panels SSSMR Type-1, Type-2 and Type 3 shall be designed in accordance with AISI SG-973. The structural section properties used in the design of the panels shall be determined using the unloaded shape of the roof panels. The calculated panel deflection from concentrated loads shall not exceed 1/180 of the span length. The calculated panel deflection under applied live load, snow, or wind load shall not exceed 1/180 times the span length. Deflections shall be based on panels being continuous across three

or more supports. Deflection shall be calculated and measured along the major ribs of the panels.

#### 1.3.9 Accessories and Their Fasteners

Accessories and their fasteners shall be capable of resisting the specified design wind uplift forces and shall allow for thermal movement of the roof panel system. Exposed fasteners shall not restrict free movement of the roof panel system resulting from thermal forces. There shall be a minimum of two fasteners per clip. Single fasteners with a minimum diameter of 3/8 inch will be allowed when the supporting structural members are prepunched or predrilled.

#### 1.4 PERFORMANCE REQUIREMENTS

Each SSSMR shall be tested for wind uplift resistance in accordance with ASTM E 1592; SSSMR systems previously tested and approved by the Corps of Engineers' STANDARD TEST METHOD FOR STRUCTURAL PERFORMANCE OF SSMRS BY UNIFORM STATIC AIR PRESSURE DIFFERENCE may be acceptable. Two tests shall be performed. Test 1 shall simulate the edge condition with one end having crosswise restraint and other end free of crosswise restraint. The maximum span length for the edge condition shall be 30 inches. Test 2 shall simulate the interior condition with both ends free of crosswise restraint. The maximum span length for the interior condition shall be 5.0 feet. External reinforcement, such as clamps on the ribs, shall not be installed to improve uplift resistance. Bolts through seams shall not be installed.

#### 1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

##### SD-02 Shop Drawings

Structural Standing Seam Metal Roof System; G-AE.

Metal roofing drawings and specifications and erection drawings; shop coating and finishing specifications; and other data as necessary to clearly describe design, materials, sizes, layouts, standing seam configuration, construction details, provisions for thermal movement, line of panel fixity, fastener sizes and spacings, sealants and erection procedures. Drawings shall reflect the intent of the architectural detailing using the manufacturer's proprietary products and fabricated items as required. The SSSMR system shop drawings shall be provided by the metal roofing manufacturer. Show relationships with adjacent and interfacing work.

Moisture Vapor Control System; G-AE

Submit moisture vapor control membrane drawings and specifications and erection drawings; and other data as necessary to clearly describe materials, sheet configuration, construction details, method for sealing of seams and erection procedures. Drawings shall show all the edge conditions, how the membrane shall coordinate with adjacent building features and highlight for the

installer any locations requiring extra care in installation.  
Drawings shall be coordinated with the metal roofing manufacturer.

#### SD-03 Product Data

Design Analysis; G-AE.

Design analysis signed by a Registered Professional Engineer employed by the SSSMR manufacturer. The design analysis shall include a list of the design loads, and complete calculations for the support system (when provided by the Contractor), roofing system and its components; screw pullout test results, and shall indicate how expected thermal movements are accommodated.

Qualifications

Qualifications of the manufacturer and installer.

#### SD-04 Samples

Accessories; G-AE.

One sample of each type of flashing, trim, closure, thermal spacer block, cap and similar items. Size shall be sufficient to show construction and configuration.

Roof Panels; G-AE.

One piece of each type to be used, 9 inches long, full width.

Factory Color Finish; G-AE.

Three 3 by 5 inches samples of each type and color.

Fasteners; G-AE.

Two samples of each type to be used, with statement regarding intended use. If so requested, random samples of bolts, nuts, and washers as delivered to the job site shall be taken in the presence of the Contracting Officer and provided to the Contracting Officer for testing to establish compliance with specified requirements.

Insulation; G-AE.

One piece, 12 by 12 inches, of each type and thickness to be used, with a label indicating the rated permeance (if faced) and R-values. The flame spread, and smoke developed rating shall be shown on the label or provided in a letter of certification.

Gaskets and Insulating Compounds

Two samples of each type to be used and descriptive data.

Sealant

One sample, approximately 1 pound, and descriptive data.

Concealed Anchor Clips; G-AE.

Two samples of each type used.

Subpurlins; G-AE.

One piece, 9 inches long.

EPDM Rubber Boots; G-AE.

One piece of each type.

#### SD-06 Test Reports

Uplift Resistance; G-AE.

The report shall include the following information:

- a. Details of the SSSMR system showing the roof panel cross-section with dimensions and thickness.
- b. Details of the anchor clip, dimensions, and thickness.
- c. Type of fasteners, size, and the number required for each connection.
- d. Purlins/subpurlins size and spacing used in the test.
- e. Description of the seaming operation including equipment used.
- f. Maximum allowable uplift pressures. These pressures are determined from the ultimate load divided by a factor of safety equal to 1.65.
- g. Any additional information required to identify the SSSMR system tested.
- h. Signature and seal of an independent registered engineer who witnessed the test.

#### SD-07 Certificates

Structural Standing Seam Metal Roof System

- a. Certification that the actual thickness of uncoated sheets used in SSSMRS components including roofing panels, subpurlins, and concealed anchor clips complies with specified requirements.
- b. Certification that materials used in the installation are mill certified.
- c. Previous certification of SSSMR system tested under the Corps of Engineers' Standard Test Method in lieu of ASTM E 1592 testing.
- d. Certification that the sheets to be furnished are produced under a continuing quality control program and that a representative sample consisting of not less than three pieces has

been tested and has met the quality standards specified for factory color finish.

e. Certification of installer. Installer certification shall be furnished.

f. Warranty certificate. At the completion of the project the Contractor shall furnish signed copies of the 5-year Warranty for Structural Standing Seam Metal Roof (SSSMR) System, a sample copy of which is attached to this section, and the 20-year Manufacturer's Material Warranties, and the manufacturer's 20-year system weathertightness warranty.

#### 1.6 DELIVERY AND STORAGE

Materials shall be delivered to the site in a dry and undamaged condition and stored out of contact with the ground. Materials shall be covered with weathertight coverings and kept dry. Storage conditions shall provide good air circulation and protection from surface staining. Protect components during fabrication and packing from mechanical abuse, stains, discoloration and corrosion. Provide protective interleaving between contact areas of exposed surfaces to prevent abrasion during shipment, storage and handling.

#### 1.7 WARRANTIES

The SSSMR system shall be warranted as outlined below. Any emergency temporary repairs conducted by the owner shall not negate the warranties.

##### 1.7.1 Contractor's Weathertightness Warranty

The SSSMR system shall be warranted by the Contractor on a no penal sum basis for a period of five years against material and workmanship deficiencies; system deterioration caused by exposure to the elements and/or inadequate resistance to specified service design loads, water leaks, and wind uplift damage. The SSSMR system covered under this warranty shall include the entire roofing system including, but not limited to, the standing seam metal roof panels, fasteners, connectors, roof securement components, and assemblies tested and approved in accordance with ASTM E 1592. In addition, the system shall consist of panel finishes, slip sheet, insulation, vapor retarder, all accessories, components, and trim and all connections with roof panels. This includes roof penetration items such as vents,; eaves, ridge, or other roof system flashings installed and any other components specified within this contract to provide a weathertight roof system; and items specified in other sections of these specifications that are part of the SSSMR system. All material and workmanship deficiencies, system deterioration caused by exposure to the elements and/or inadequate resistance to specified design loads, water leaks and wind uplift damage shall be repaired as approved by the Contracting Officer. See the attached Contractor's required warranty for issue resolution of warrantable defects. This warranty shall warrant and cover the entire cost of repair or replacement, including all material, labor, and related markups. The Contractor shall supplement this warranty with written warranties from the installer and system manufacturer, which shall be submitted along with Contractor's warranty; however, the Contractor shall be ultimately responsible for this warranty. The Contractor's written warranty shall be as outlined in attached WARRANTY FOR STRUCTURAL STANDING SEAM METAL ROOF (SSSMR) SYSTEM, and shall start upon final acceptance of the facility. It is required that the Contractor provide a separate bond in an amount equal to the installed total roofing

system cost in favor of the owner (Government) covering the Contractor's warranty responsibilities effective throughout the five year Contractor's warranty period for the entire SSSMR system as outlined above.

#### 1.7.2 Manufacturer's Material Warranties.

The Contractor shall furnish, in writing, the following manufacturer's material warranties which cover all SSSMR system components such as roof panels, anchor clips and fasteners, flashing, accessories, and trim, fabricated from coil material. These warranties shall be from a single manufacturer for the entire roofing system and shall take into consideration the use of the snow-guard system selected.

a. A manufacturer's 20 year material warranty warranting that the aluminum, zinc-coated steel, aluminum-zinc alloy coated steel or aluminum-coated steel as specified herein will not rupture, structurally fail, fracture, deteriorate, or become perforated under normal design atmospheric conditions and service design loads. Liability under this warranty shall be limited exclusively to the cost of either repairing or replacing nonconforming, ruptured, perforated, or structurally failed coil material.

b. A manufacturer's 20 year exterior material finish warranty on the factory colored finish warranting that the finish, under normal atmospheric conditions at the site, will not crack, peel, or delaminate; chalk in excess of a numerical rating of eight, as determined by ASTM D 4214 test procedures; or change color in excess of five CIE or Hunter Lab color difference (delta E) units in accordance with ASTM D 2244. Liability under this warranty is exclusively limited to refinishing with an air-drying version of the specified finish or replacing the defective coated material.

c. A roofing system manufacturer's 30 year, non-prorated, system weathertightness warranty.

#### 1.8 COORDINATION MEETING

A coordination meeting shall be held 30 days prior to the first submittal, for mutual understanding of the Structural Standing Seam Metal Roof (SSSMR) System contract requirements. This meeting shall take place at the building site and shall include representatives from the Contractor, the roof system manufacturer, the roofing supplier, the erector, the SSSMR design engineer of record, the independent construction observation and testing agency, and the Contracting Officer. All items required by paragraph SUBMITTALS shall be discussed, including applicable standard manufacturer shop drawings, and the approval process. The Contractor shall coordinate time and arrangements for the meeting.

### PART 2 PRODUCTS

#### 2.1 ROOF PANELS

The structural standing seam metal roofing system panels shall be steel and shall have a factory color finish. Length of sheets shall be sufficient to cover the entire length of any unbroken roof slope for areas shown on drawings or slope lengths that do not exceed 30 feet. When length of run exceeds 30 feet and panel laps are provided, each sheet in the run shall extend over three or more supports. Sheets longer than 100 feet may be furnished if approved by the Contracting Officer. Width of sheets shall provide not more than 24 inches of coverage in place. SSSMR system with

roofing panels greater than 12 inches in width shall have standing seams rolled during installation by an electrically driven seaming machine. Height of standing seams shall be not less than 2-3/8 inches for rolled seam and 2-3/8 inches for seams that are not rolled. Panel profile shall exhibit distinct mesas, ribs and other stiffening configurations.

#### 2.1.1 Steel Panels

Steel panels shall be aluminum-zinc alloy coated steel conforming to ASTM A 792/A 792M, AZ 55 coating. Zinc-aluminum alloy coated panels shall be 0.023 inch thick minimum. Panels shall be within 95 percent of reported tested thickness as noted in wind uplift resistance testing required in paragraph PERFORMANCE REQUIREMENTS. Mill finish panels shall be treated with a passivating chemical to inhibit the formation of oxide corrosion products. Panels that have become wet during shipment and have started to oxidize shall be rejected.

#### 2.2 CONCEALED ANCHOR CLIPS

Concealed anchor clips shall be the same as the tested roofing system. Clip bases shall have factory punched or drilled holes for attachment. Clips shall be made from multiple pieces with the allowance for the total thermal movement required to take place within the clip. Single piece clips may be acceptable when the manufacturer can substantiate that the system can accommodate the thermal cyclic movement under sustained live or snow loads. Concealed anchor clips shall be the same as the tested roofing system. Clip bases shall have factory punched or drilled holes for attachment. Clips shall provide allowance for the total thermal movement required to take place separately from the clip. Sealant applied in the panel caps must be isolated from the clip. The clip shall hold the panel away from the supporting members a minimum of 3/8 inches.

#### 2.3 ACCESSORIES

Flashing, trim, metal closure strips, caps and similar metal accessories shall be the manufacturer's standard products. Exposed metal accessories shall be finished to match the panels furnished. Molded closure strips shall be closed-cell or solid-cell synthetic rubber or neoprene, or polyvinyl chloride premolded to match configuration of the panels and shall not absorb or retain water. Die cast metal closures shall be installed with double bead tape sealant and fasteners that stitch the panel to a 16 gage preformed backer plate to ensure a positive compression of the tape sealant. The use of a continuous angle butted to the panel ends to form a closure will not be allowed. Panel cap shall receive two beads of sealant that shall be applied independently of the anchor clip. Sealant shall be SIS (Styrene-Isoprene-Styrene) block copolymer type, thermoplastic rubber adhesive non-fatiguing water barrier.

#### 2.4 FASTENERS

Fasteners for steel roof panels shall be zinc-coated steel, corrosion resisting steel, or nylon capped steel, type and size specified below or as otherwise approved for the applicable requirements. Fasteners for structural connections shall provide both tensile and shear ultimate strengths of not less than 750 pounds per fastener. Fasteners for accessories shall be the manufacturer's standard. Exposed roof fasteners shall be sealed or have sealed washers on the exterior side of the roof to waterproof the fastener penetration. Washer material shall be compatible with the roofing; have a minimum diameter of 3/8 inch for structural

connections; and gasketed portion of fasteners or washers shall be neoprene or other equally durable elastomeric material approximately 1/8 inch thick.

Exposed fasteners for factory color finished panels shall be factory finished to match the color of the panels.

#### 2.4.1 Screws

Screws for attaching anchor devices shall be not less than No. 14. Actual screw pull out test results shall be performed for the actual material gage and yield strength of the structural purlins or subpurlins to which the clip is to be anchored/attached. Other screws shall be as recommended by the manufacturer to meet the strength design requirements of the panels.

#### 2.4.2 Bolts

Bolts shall be not less than 1/4 inch diameter, shouldered or plain shank as required, with locking washers and nuts.

#### 2.4.3 Structural Blind Fasteners

Blind screw-type expandable fasteners shall be not less than 1/4 inch diameter. Blind (pop) rivets shall be not less than 9/32 inch minimum diameter.

### 2.5 SUBPURLINS

Cold formed supporting structural members/subpurlins shall have a minimum thickness of 0.059 inches and a minimum tensile yield strength of 50000 psi.

Hot rolled structural members shall have a minimum thickness of 0.25 inches and a minimum tensile yield strength of 36000 psi. Subpurlins shall be shop painted.

### 2.6 FACTORY COLOR FINISH

Panels shall have a factory applied polyvinylidene fluoride finish on the exposed side. The exterior finish shall consist of a baked-on topcoat with an appropriate prime coat. Color shall match the color indicated in Section 09915 COLOR SCHEDULE. The exterior coating shall be a nominal 1 mil thickness consisting of a topcoat of not less than 0.7 mil dry film thickness and the paint manufacturer's recommended primer of not less than 0.2 mil thickness. The interior color finish shall consist of a 0.2 mil thick prime coat. The exterior color finish shall meet the test requirements specified below.

#### 2.6.1 Salt Spray Test

A sample of the sheets shall withstand a cyclic corrosion test for a minimum of 1000 hours in accordance with ASTM B 117, including the scribe requirement in the test. Immediately upon removal of the panel from the test, the coating shall receive a rating of not less than 10, no blistering, as determined by ASTM D 714; ASTM D 610; and a rating of 6, over 21/16 to 1/8 inch failure at scribe, as determined by ASTM D 1654.

#### 2.6.2 Formability Test

When subjected to testing in accordance with ASTM D 522 Method B, 1/8 inch diameter mandrel, the coating film shall show no evidence of cracking to the naked eye.



### 2.6.3 Accelerated Weathering, Chalking Resistance and Color Change

A sample of the sheets shall be tested in accordance with ASTM D 822, for 2000 total hours. The coating shall withstand the weathering test without cracking, peeling, blistering, loss of adhesion of the protective coating, or corrosion of the base metal. Protective coating with an adhesion rating less than 4B when tested in accordance with ASTM D 3359, Test Method B, shall be considered as an area indicating loss of adhesion. Following the accelerated weathering test, the coating shall have a chalk rating not less than No. 8 in accordance with ASTM D 4214 test procedures, and the color change shall not exceed 5 CIE or Hunter Lab color difference (delta E) units in accordance with ASTM D 2244. For sheets required to have a low gloss finish, the chalk rating shall be not less than No. 6 and the color difference shall be not greater than 7 units.

### 2.6.4 Humidity Test

When subjected to a humidity cabinet test in accordance with ASTM D 2247 for 2000 hours, a scored panel shall show no signs of blistering, cracking, creepage or corrosion.

### 2.6.5 Impact Resistance

Factory-painted sheet shall withstand direct and reverse impact in accordance with ASTM D 2794 0.500 inch diameter hemispherical head indenter, equal to 1.5 times the metal thickness in mils, expressed in inch-pounds, with no cracking.

### 2.6.6 Abrasion Resistance Test

When subjected to the falling sand test in accordance with ASTM D 968, Method A, the coating system shall withstand a minimum of 50 liters of sand before the appearance of the base metal. The term "appearance of base metal" refers to the metallic coating on steel or the aluminum base metal.

### 2.6.7 Specular Gloss

Finished roof surfaces for SSSMR Type 1, Type 2 and Type 3 shall have a specular gloss value of 10 or less at an angle of 85 degrees when measured in accordance with ASTM D 523.

### 2.6.8 Pollution Resistance

Coating shall show no visual effects when covered spot tested in a 10 percent hydrochloric acid solution for 24 hours in accordance with ASTM D 1308.

## 2.7 INSULATION

Thermal resistance of insulation shall be not less than the R-values shown on the contract drawings. R-values of polyisocyanurate board insulations shall be determined at a mean temperature of 75 degrees F in accordance with ASTM C 518. Insulation shall be a standard product with the insulation manufacturer, factory marked or identified with insulation manufacturer's name or trademark and R-value. Identification shall be on individual pieces or individual packages. Insulation, including facings, shall have a flame spread not in excess of 50 and a smoke developed rating not in excess of 25 when tested in accordance with ASTM E 84. The stated R-value of the insulation shall be certified by an independent Registered

Professional Engineer if tests are conducted in the insulation manufacturer's laboratory.

#### 2.7.1 Polyisocyanurate Rigid Board Insulation for Use Above a Roof Deck

Polyisocyanurate insulation shall conform to ASTM C 1289, Type II. For polyisocyanurate, the maximum design R-value per 1 inch of insulation used shall be 7.2. Facings shall be non-asphaltic, glass fiber reinforced.

#### 2.7.2 Blanket Insulation

Blanket insulation shall conform to ASTM C 665, Type 1.

#### 2.7.3 Glass Mat Gypsum Roof Board

Glass mat gypsum roof board for use above the deck shall have a flame spread - 0, smoke developed - 0, shall be water resistant and have a compressive strength of 500 psi. Glass mat gypsum roof board shall have a non-asphaltic coating on one side and conform to ASTM C 1177/C 1177M.

### 2.8 INSULATION RETAINERS

Insulation retainers shall be type, size, and design necessary to adequately hold the insulation and to provide a neat appearance. Metallic retaining members shall be nonferrous or have a nonferrous coating. Nonmetallic retaining members, including adhesives used in conjunction with mechanical retainers or at insulation seams, shall have a fire resistance classification not less than that permitted for the insulation.

### 2.9 SEALANT

Sealants shall be elastomeric type containing no oil or asphalt. Exposed sealant shall be colored to match the applicable building color and shall cure to a rubberlike consistency. Sealant placed in the roof panel standing seam ribs shall be provided in accordance with the manufacturer's recommendations.

### 2.10 GASKETS AND INSULATING COMPOUNDS

Gaskets and insulating compounds shall be nonabsorptive and suitable for insulating contact points of incompatible materials. Insulating compounds shall be nonrunning after drying.

### 2.11 VAPOR RETARDER

#### 2.11.1 Reinforced Vapor Barrier

Reinforced vapor barrier material shall be a 3-ply laminated sheeting material with 1 mil aluminum core with a layer of multi-axially oriented, high density polyethylene on both sides. A full compatible double-sided asphaltic pressure sensitive mastic seaming tape and polyethylene attachment tape will be provided.

#### 2.11.2 Vapor Barrier Performance Criteria

- a. Tensile Strength, ASTM D 882: 42 lb/3000 psi
- b. Weight, ASTM D 3776; 70 lb/1000 sf
- c. Puncture propagation Tear, ASTM D 2582: 15 lbs
- d. Water Vapor Transmission Rate, ASTM E 96: 0.000 g/100 sq.in./24hr

### 2.11.3 Slip Sheet Under Metal Roof System

Slip sheet for use under metal roof system shall be a 5 lb. per 100 square feet rosin-sized, unsaturated building paper.

### 2.12 RUBBERIZED UNDERLAYMENT

Cold applied composite sheet consisting of rubberized asphalt and cross-laminated high density polyethylene film intended for use as underlayment for metal roof and wall panels. Not less than 40 mils minimum thickness is required.

#### 2.12.1 Rubberized Underlayment Sheeting Performance Requirements

- a. Tensile Strength, ASTM D 412, Die C: 250 psi minimum;
- b. Ultimate Elongation, ASTM D 412, Die C: 200 percent minimum;
- c. Water Vapor Transmission, ASTM E 96: 0.05 perm maximum;
- d. Low Temperature Flexibility, ASTM D 1970: Unaffected at -20 degrees F;
- f. Adhesion to Plywood, ASTM D 903: 3 pounds per inch width.

### 2.13 Plywood Sheathing

Plywood shall conform to PS1, APA E445R or PS2, Grade C-D or sheathing grade with exterior glue. Sheathing for roof without corner shall have a span rating of 24/0 or greater for supports 24 inches on center.

### 2.14 SNOW GUARDS

Snow guards shall be the standard product of a manufacturer who has been in the practice of manufacturing snow guard systems for a period of not less than 3 years. The system shall consist of a 12 gauge stainless steel clamp which holds a 16 gauge 1 inch by 1 inch galvanized steel tube painted to match the roof. Clamps shall be designed to attach to the standing seams with stainless steel screws. Provide ice-stopper shapes designed to hang from the bar in the center of the panel.

### 2.15 EPDM RUBBER BOOTS

Flashing devices around pipe penetrations shall be flexible, one-piece devices molded from weather-resistant EPDM rubber. Rubber boot material shall be as recommended by the manufacturer. The boots shall have base rings made of aluminum or corrosion resisting steel that conform to the contours of the roof panel to form a weather-tight seal.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Installation of the structural standing seam metal roof system shall be in accordance with the manufacturer's erection instructions and drawings. Dissimilar materials which are not compatible when contacting each other shall be insulated by means of gaskets or insulating compounds. Molded closure strips shall be installed wherever roofing sheets terminate in open-end configurations, exclusive of flashings. The closure strip installation shall be weather-tight and sealed. Screws shall be installed with a clutching screw gun, to assure screws are not stripped. Field test shall be conducted on each gun prior to starting installation and

periodically thereafter to assure it is adjusted properly to install particular type and size of screw as recommended by manufacturer's literature. Improper or mislocated drill holes shall be plugged with an oversize screw fastener and gasketed washer; however, sheets with an excess of such holes or with such holes in critical locations shall not be used. Exposed surfaces and edges shall be kept clean and free from sealant, metal cuttings, hazardous burrs, and other foreign material. Stained, discolored, or damaged sheets shall be removed from the site.

#### 3.1.1 Field Forming of Panels for Unique Area

When roofing panels are formed from factory-color-finished steel coils at the project site, the same care and quality control measures that are taken in shop forming of roofing panels shall be observed. Rollformer shall be operated by the metal roofing manufacturer's representative. In cold weather conditions, preheating of the steel coils to be field formed shall be performed as necessary just prior to the rolling operations.

#### 3.1.2 Subpurlins

Unless otherwise shown, subpurlins shall be anchored to the purlins or other structural framing members with bolts or screws. The subpurlin spacing shall not exceed 30 inches on centers at the corner, edge and ridge zones, and 5 foot maximum on centers for the remainder of SSSMR Type 1 roof and 2 foot maximum on centers for SSSMR Type 2 and Type 3. Corner, edge, and ridge zones are as defined in ASCE 7.

#### 3.1.3 Roof Panel Installation

Roof panels shall be installed with the standing seams in the direction of the roof slope. The side seam connections for installed panels shall be completed at the end of each day's work. Method of applying joint sealant shall conform to the manufacturer's recommendation to achieve a complete weather-tight installation. End laps of panels shall be provided in accordance with the manufacturer's instructions. Closures, flashings, EPDM rubber boots, roof curbs, and related accessories shall be installed according to the manufacturer's drawings. Fasteners shall not puncture roofing sheets except as provided for in the manufacturer's instructions for erection and installation. Expansion joints for the standing seam roof system shall be installed at locations indicated on the contract drawings and other locations indicated on the manufacturer's drawings.

#### 3.1.4 Concealed Anchor Clips

Concealed anchor clips shall be fastened directly to the structural framing members. Attachment to the substrate (when provided) or to the metal deck is not permitted. The maximum distance, parallel to the seams, between clips shall be 30 inches on center at the corner, edge, and ridge zones, and 5 feet maximum on centers for the remainder of the roof.

#### 3.1.5 Plywood Sheathing Panels at SSSMR Type 3

Sheathing shall be applied with edges 1/8 inch apart at side and end joints, and fastened at supported edges at 6 inches on center and at intermediate supports 12 inches on center unless otherwise shown. Fastening of edges shall be 3/8 inch from the edges.

### 3.2 INSULATION INSTALLATION

Insulation shall be continuous over entire roof surface. Where expansion joints, terminations, and other connections are made, the cavity shall be filled with batt insulation with vapor retarder providing equivalent R-value and perm rating as remaining insulation. Insulation shall be installed as indicated and in accordance with manufacturer's instructions.

#### 3.2.1 Board Insulation with Blanket Insulation

Rigid or semirigid board insulation shall be laid in close contact. Board shall be attached to the metal roof deck with bearing plates and fasteners, as recommended by the insulation manufacturer, so that the insulation joints are held tight against each other, and shall have a minimum of 1 fastener per 4 square feet. Layout and joint pattern of insulation and fasteners shall be indicated on the shop drawings. If more than one layer of insulation is required, joints in the second layer shall be offset from joints in the first layer. A layer of blanket insulation shall be placed over the rigid or semirigid board insulation to be compressed against the underside of the metal roofing to reduce thermal bridging, dampen noise, and prevent roofing flutter. This layer of blanket insulation shall be compressed a minimum of 50 percent.

### 3.3 VAPOR RETARDER INSTALLATION

The moisture vapor control system shall be installed according to the Shop Drawings. All installing staff shall be made aware of the special needs of this system. None of the other roofing components shall be installed until specific supervisory approval has been made regarding the installed moisture vapor control components.

#### 3.3.1 Reinforced Vapor Barrier

The reinforced vapor barrier membrane shall be installed over the rubberized underlayment at areas shown on the drawings. A fully compatible double sided asphaltic pressure sensitive mastic tape shall be used to seal the edges of the sheets to provide a vapor tight membrane. Sheet edges shall be lapped not less than 6 inches. Sufficient material shall be provided to avoid inducing stresses in the sheets due to stretching or binding. All tears or punctures that are visible in the finished surface at any time during the construction process shall be sealed with polyethylene tape.

### 3.4 RUBBERIZED UNDERLAYMENT

All side laps shall be minimum 3-1/2 inches and end laps shall be 6 inches. Laps shall be self adhesive mastic as per manufacturer's recommendation. Roll or firmly press to adhere membrane to substrate. Flash projections with a second ply of membrane for a distance of 6 inches from the projection. Finish exposed, terminated edges of membrane on sloped or vertical surfaces with a trowelled bead of mastic. Apply mastic around edges of membrane and projections. Apply mastic at end of each work day. Install membrane where indicated on drawings.

### 3.5 GLASS MATT GYPSUM ROOF BOARD

The glass mat gypsum roof board sheathing shall be mechanically fastened to the roof deck as per manufacturer's recommendations. Use maximum lengths possible to minimize the amount of joints. Support parallel edge joints

with deck ribs. Stagger end joints locations. Install wood blocking in roof deck voids at subpulin locations.

### 3.6 SLIP SHEET INSTALLATION

A slip sheet shall be laid over the blanket insulation facing at SSSMR Type 1 and Type 2 and over rubberized underlayment at SSSMR Type 3 to prevent the vinyl facing from adhering to the metal roofing.

### 3.7 CLEANING AND TOUCH-UP

Exposed SSSMR systems shall be cleaned at completion of installation. Debris that could cause discoloration and harm to the panels, flashings, closures and other accessories shall be removed. Grease and oil films, excess sealants, and handling marks shall be removed and the work shall be scrubbed clean. Exposed metal surfaces shall be free of dents, creases, waves, scratch marks, and solder or weld marks. Immediately upon detection, abraded or corroded spots on shop-painted surfaces shall be wire brushed and touched up with the same material used for the shop coat. Factory color finished surfaces shall be touched up with the manufacturer's recommended touch up paint.

CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY  
FOR  
STRUCTURAL STANDING SEAM METAL ROOF (SSSMR) SYSTEM

FACILITY DESCRIPTION \_\_\_\_\_

BUILDING NUMBER: \_\_\_\_\_

CORPS OF ENGINEERS CONTRACT NUMBER: \_\_\_\_\_

CONTRACTOR

CONTRACTOR: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

POINT OF CONTACT: \_\_\_\_\_

TELEPHONE NUMBER: \_\_\_\_\_

OWNER

OWNER: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

POINT OF CONTACT: \_\_\_\_\_

TELEPHONE NUMBER: \_\_\_\_\_

CONSTRUCTION AGENT

CONSTRUCTION AGENT: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

POINT OF CONTACT: \_\_\_\_\_

TELEPHONE NUMBER: \_\_\_\_\_

CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY  
FOR  
STRUCTURAL STANDING SEAM METAL ROOF (SSSMR) SYSTEM  
(continued)

THE SSSMR SYSTEM INSTALLED ON THE ABOVE NAMED BUILDING IS WARRANTED BY \_\_\_\_\_ FOR A PERIOD OF FIVE (5) YEARS AGAINST WORKMANSHIP AND MATERIAL DEFICIENCIES, WIND DAMAGE, STRUCTURAL FAILURE, AND LEAKAGE. THE SSSMR SYSTEM COVERED UNDER THIS WARRANTY SHALL INCLUDE, BUT SHALL NOT BE LIMITED TO, THE FOLLOWING: THE ENTIRE ROOFING SYSTEM, MANUFACTURER SUPPLIED FRAMING AND STRUCTURAL MEMBERS, METAL ROOF PANELS, FASTENERS, CONNECTORS, ROOF SECUREMENT COMPONENTS, AND ASSEMBLIES TESTED AND APPROVED IN ACCORDANCE WITH ASTM E 1592. IN ADDITION, THE SYSTEM PANEL FINISHES, SLIP SHEET, INSULATION, VAPOR RETARDER, ALL ACCESSORIES, COMPONENTS, AND TRIM AND ALL CONNECTIONS ARE INCLUDED. THIS INCLUDES ROOF PENETRATION ITEMS SUCH AS VENTS, CURBS, SKYLIGHTS; INTERIOR OR EXTERIOR GUTTERS AND DOWNSPOUTS; EAVES, RIDGE, HIP, VALLEY, RAKE, GABLE, WALL, OR OTHER ROOF SYSTEM FLASHINGS INSTALLED AND ANY OTHER COMPONENTS SPECIFIED WITHIN THIS CONTRACT TO PROVIDE A WEATHERTIGHT ROOF SYSTEM; AND ITEMS SPECIFIED IN OTHER SECTIONS OF THE SPECIFICATIONS THAT ARE PART OF THE SSSMR SYSTEM.

ALL MATERIAL DEFICIENCIES, WIND DAMAGE, STRUCTURAL FAILURE, AND LEAKAGE ASSOCIATED WITH THE SSSMR SYSTEM COVERED UNDER THIS WARRANTY SHALL BE REPAIRED AS APPROVED BY THE CONTRACTING OFFICER. THIS WARRANTY SHALL COVER THE ENTIRE COST OF REPAIR OR REPLACEMENT, INCLUDING ALL MATERIAL, LABOR, AND RELATED MARKUPS. THE ABOVE REFERENCED WARRANTY COMMENCED ON THE DATE OF FINAL ACCEPTANCE ON \_\_\_\_\_ AND WILL REMAIN IN EFFECT FOR STATED DURATION FROM THIS DATE.

SIGNED, DATED, AND NOTARIZED (BY COMPANY PRESIDENT)

\_\_\_\_\_  
(Company President)

\_\_\_\_\_  
(Date)



CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY  
FOR  
STRUCTURAL STANDING SEAM METAL ROOF (SSSMR) SYSTEM  
(continued)

THE CONTRACTOR SHALL SUPPLEMENT THIS WARRANTY WITH WRITTEN WARRANTIES FROM THE MANUFACTURER AND/OR INSTALLER OF THE SSSMR SYSTEM, WHICH SHALL BE SUBMITTED ALONG WITH THE CONTRACTOR'S WARRANTY. HOWEVER, THE CONTRACTOR WILL BE ULTIMATELY RESPONSIBLE FOR THIS WARRANTY AS OUTLINED IN THE SPECIFICATIONS AND AS INDICATED IN THIS WARRANTY EXAMPLE.

EXCLUSIONS FROM COVERAGE

1. NATURAL DISASTERS, ACTS OF GOD (LIGHTNING, FIRE, EXPLOSIONS, SUSTAINED WIND FORCES IN EXCESS OF THE DESIGN CRITERIA, EARTHQUAKES, AND HAIL).
2. ACTS OF NEGLIGENCE OR ABUSE OR MISUSE BY GOVERNMENT OR OTHER PERSONNEL, INCLUDING ACCIDENTS, VANDALISM, CIVIL DISOBEDIENCE, WAR, OR DAMAGE CAUSED BY FALLING OBJECTS.
3. DAMAGE BY STRUCTURAL FAILURE, SETTLEMENT, MOVEMENT, DISTORTION, WARPAGE, OR DISPLACEMENT OF THE BUILDING STRUCTURE OR ALTERATIONS MADE TO THE BUILDING.
4. CORROSION CAUSED BY EXPOSURE TO CORROSIVE CHEMICALS, ASH OR FUMES GENERATED OR RELEASED INSIDE OR OUTSIDE THE BUILDING FROM CHEMICAL PLANTS, FOUNDRIES, PLATING WORKS, KILNS, FERTILIZER FACTORIES, PAPER PLANTS, AND THE LIKE.
5. FAILURE OF ANY PART OF THE SSSMR SYSTEM DUE TO ACTIONS BY THE OWNER TO INHIBIT FREE DRAINAGE OF WATER FROM THE ROOF AND GUTTERS AND DOWNSPOUTS OR ALLOW PONDING WATER TO COLLECT ON THE ROOF SURFACE. CONTRACTOR'S DESIGN SHALL INSURE FREE DRAINAGE FROM THE ROOF AND NOT ALLOW PONDING WATER.
6. THIS WARRANTY APPLIES TO THE SSSMR SYSTEM. IT DOES NOT INCLUDE ANY CONSEQUENTIAL DAMAGE TO THE BUILDING INTERIOR OR CONTENTS WHICH IS COVERED BY THE WARRANTY OF CONSTRUCTION CLAUSE INCLUDED IN THIS CONTRACT.
7. THIS WARRANTY CANNOT BE TRANSFERRED TO ANOTHER OWNER WITHOUT WRITTEN CONSENT OF THE CONTRACTOR; AND THIS WARRANTY AND THE CONTRACT PROVISIONS WILL TAKE PRECEDENCE OVER ANY CONFLICTS WITH STATE STATUTES.

★★

CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY  
FOR  
STRUCTURAL STANDING SEAM METAL ROOF (SSSMR) SYSTEM  
(continued)

\*\*REPORTS OF LEAKS AND SSSMR SYSTEM DEFICIENCIES SHALL BE RESPONDED TO WITHIN 48 HOURS OF RECEIPT OF NOTICE, BY TELEPHONE OR IN WRITING, FROM EITHER THE OWNER OR CONTRACTING OFFICER. EMERGENCY REPAIRS TO PREVENT FURTHER ROOF LEAKS SHALL BE INITIATED IMMEDIATELY; A WRITTEN PLAN SHALL BE SUBMITTED FOR APPROVAL TO REPAIR OR REPLACE THIS SSSMR SYSTEM WITHIN SEVEN (7) CALENDAR DAYS. ACTUAL WORK FOR PERMANENT REPAIRS OR REPLACEMENT SHALL BE STARTED WITHIN 30 DAYS AFTER RECEIPT OF NOTICE, AND COMPLETED WITHIN A REASONABLE TIME FRAME. IF THE CONTRACTOR FAILS TO ADEQUATELY RESPOND TO THE WARRANTY PROVISIONS, AS STATED IN THE CONTRACT AND AS CONTAINED HEREIN, THE CONTRACTING OFFICER MAY HAVE THE SSSMR SYSTEM REPAIRED OR REPLACED BY OTHERS AND CHARGE THE COST TO THE CONTRACTOR.

IN THE EVENT THE CONTRACTOR DISPUTES THE EXISTENCE OF A WARRANTABLE DEFECT, THE CONTRACTOR MAY CHALLENGE THE OWNER'S DEMAND FOR REPAIRS AND/OR REPLACEMENT DIRECTED BY THE OWNER OR CONTRACTING OFFICER EITHER BY REQUESTING A CONTRACTING OFFICER'S DECISION UNDER THE CONTRACT DISPUTES ACT, OR BY REQUESTING THAT AN ARBITRATOR RESOLVE THE ISSUE. THE REQUEST FOR AN ARBITRATOR MUST BE MADE WITHIN 48 HOURS OF BEING NOTIFIED OF THE DISPUTED DEFECTS. UPON BEING INVOKED, THE PARTIES SHALL, WITHIN TEN (10) DAYS, JOINTLY REQUEST A LIST OF FIVE (5) ARBITRATORS FROM THE FEDERAL MEDIATION AND CONCILIATION SERVICE. THE PARTIES SHALL CONFER WITHIN TEN (10) DAYS AFTER RECEIPT OF THE LIST TO SEEK AGREEMENT ON AN ARBITRATOR. IF THE PARTIES CANNOT AGREE ON AN ARBITRATOR, THE CONTRACTING OFFICER AND THE PRESIDENT OF THE CONTRACTOR'S COMPANY WILL STRIKE ONE (1) NAME FROM THE LIST ALTERNATIVELY UNTIL ONE (1) NAME REMAINS. THE REMAINING PERSON SHALL BE THE DULY SELECTED ARBITRATOR. THE COSTS OF THE ARBITRATION, INCLUDING THE ARBITRATOR'S FEE AND EXPENSES, COURT REPORTER, COURTROOM OR SITE SELECTED, ETC., SHALL BE BORNE EQUALLY BETWEEN THE PARTIES. EITHER PARTY DESIRING A COPY OF THE TRANSCRIPT SHALL PAY FOR THE TRANSCRIPT. A HEARING WILL BE HELD AS SOON AS THE PARTIES CAN MUTUALLY AGREE. A WRITTEN ARBITRATOR'S DECISION WILL BE REQUESTED NOT LATER THAN 30 DAYS FOLLOWING THE HEARING. THE DECISION OF THE ARBITRATOR WILL NOT BE BINDING; HOWEVER, IT WILL BE ADMISSIBLE IN ANY SUBSEQUENT APPEAL UNDER THE CONTRACT DISPUTES ACT.

A FRAMED COPY OF THIS WARRANTY SHALL BE POSTED IN THE MECHANICAL ROOM OR OTHER APPROVED LOCATION DURING THE ENTIRE WARRANTY PERIOD.

-- End of Section --

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DIVISION 07 - THERMAL AND MOISTURE PROTECTION

SECTION 07600

FLASHING AND SHEET METAL

02/03

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-- End of Section Table of Contents --

## SECTION 07600

FLASHING AND SHEET METAL  
02/03

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

SHEET METAL & AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION  
(SMACNA)

SMACNA Arch. Manual (1993; Errata; Addenda Oct 1997; 4th  
Printing 1999) Architectural Sheet Metal  
Manual

## 1.2 General Requirements

Sheet metalwork shall be accomplished to form weathertight construction without waves, warps, buckles, fastening stresses or distortion, and shall allow for expansion and contraction. Cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades shall be performed by sheet metal mechanics. Sheet metalwork pertaining to heating, ventilating, and air conditioning is specified in Section 15895 AIR SUPPLY, DISTRIBUTION VENTILATION AND EXHAUST SYSTEM.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-02 Shop Drawings

Through-Wall Flashing; G-AE

Indicate thicknesses, dimensions, fastenings and anchoring methods, expansion joints, and other provisions necessary for thermal expansion and contraction. Scaled manufacturer's catalog data may be submitted for factory fabricated items.

## 1.4 DELIVERY, HANDLING, AND STORAGE

Package and protect materials during shipment. Uncrate and inspect materials for damage, dampness, and wet-storage stains upon delivery to the job site. Remove from the site and replace damaged materials that cannot be restored to like-new condition. Handle sheet metal items to avoid

damage to surfaces, edges, and ends. Store materials in dry, weather-tight, ventilated areas until immediately before installation.

## PART 2 PRODUCTS

### 2.1 MATERIALS

Lead, lead-coated metal, and galvanized steel shall not be used. Any metal listed by SMACNA Arch. Manual for a particular item may be used, unless otherwise specified or indicated. Materials shall conform to the requirements specified below and to the thicknesses and configurations established in SMACNA Arch. Manual. Different items need not be of the same metal.

Furnish sheet metal items in 8 to 10 foot lengths. Single pieces less than 8 feet long may be used to connect to factory-fabricated inside and outside corners, and at ends of runs. Factory fabricate corner pieces with minimum 12 inch legs. Provide accessories and other items essential to complete the sheet metal installation. These accessories shall be made of the same materials as the items to which they are applied. Fabricate sheet metal items of the materials specified below

#### 2.1.1 Through-Wall Flashing

Through-wall flashing for masonry is specified in Section 04200, MASONRY.

#### 2.1.2 Fasteners

Use the same metal or a metal compatible with the item fastened. Use stainless steel fasteners to fasten dissimilar materials.

## PART 3 EXECUTION

### 3.1 INSTALLATION

#### 3.1.1 Workmanship

Make lines, arrises, and angles sharp and true. Free exposed surfaces from visible wave, warp, and buckle, and tool marks. Fold back exposed edges neatly to form a hem on the concealed side. Make sheet metal exposed to the weather watertight with provisions for expansion and contraction.

Make surfaces to receive sheet metal plumb and true, clean, even, smooth, dry, and free of defects and projections which might affect the application. For installation of items not shown in detail or not covered by specifications conform to the applicable requirements of SMACNA Arch. Manual, Architectural Sheet Metal Manual.

#### 3.1.2 Protection from Contact with Dissimilar Materials

##### 3.1.2.1 Copper or Copper-bearing Alloys

Paint with heavy-bodied bituminous paint surfaces in contact with dissimilar metal, or separate the surfaces by means of moistureproof building felts.

##### 3.1.2.2 Aluminum

Aluminum surfaces shall not directly contact other metals except stainless

steel, zinc, or zinc coating. Where aluminum contacts another metal, paint the dissimilar metal with a primer followed by two coats of aluminum paint. Where drainage from a dissimilar metal passes over aluminum, paint the dissimilar metal with a non-lead pigmented paint.

#### 3.1.2.3 Metal Surfaces

Paint surfaces in contact with mortar, concrete, or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint.

#### 3.1.2.4 Wood or Other Absorptive Materials

Paint surfaces that may become repeatedly wet and in contact with metal with two coats of aluminum paint or a coat of heavy-bodied bituminous paint.

#### 3.1.3 Flashing at Roof Penetrations and Equipment Supports

Flashing for roof penetrations shall be provided in Section 07416A STRUCTURAL STANDING SEAM METAL ROOF (SSSMR) SYSTEM.

#### 3.1.4 Through-Wall Flashing

Install self-adhering drip edge and through-wall rubberized membrane flashing according to manufacturer's published directions. Install through-wall flashing at steel lintels, steel angles, plate or beam masonry supports, window and louver heads and sills, as cavity base flashing and at other locations indicated on drawings. Adhere drip edge to steel angle lintels, cavity wall bases, or brick supports full width of support, lap ends 2 inches, project folded edge minimum 1/4 inch beyond face of wall. Extend flashing vertically on rubberized wall membrane surface minimum of 16 inches above horizontal portion. Finish exposed, terminated edges of membrane with troweled bead of mastic. Extend flashing horizontally through face wythe over drip edge to align with outside face of wall. Extend flashing full width of steel lintels and turn up to form minimum 8 inches high sealed dam at both ends of lintel, using folded corners or extra thickness of flashing at corners. If using pre-formed end dams, place at ends and adhere vertical and horizontal surfaces, then cover with flashing.

### 3.2 CLEANING

Clean exposed sheet metal work at completion of installation. Remove grease and oil films, handling marks, contamination from steel wool, fittings and drilling debris, and scrub-clean. Free the exposed metal surfaces of dents, creases, waves, scratch marks, and solder or weld marks.

### 3.3 REPAIRS TO FINISH

Scratches, abrasions, and minor surface defects of finish may be repaired in accordance with the manufacturer's printed instructions and as approved. Repair damaged surfaces caused by scratches, blemishes, and variations of color and surface texture. Replace items which cannot be repaired.

-- End of Section --

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SECTION 07840

FIRESTOPPING

06/03

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-- End of Section Table of Contents --

## SECTION 07840

## FIRESTOPPING

06/03

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM E 84	(2001) Surface Burning Characteristics of Building Materials
ASTM E 119	(2000a) Fire Tests of Building Construction and Materials
ASTM E 814	(2002) Fire Tests of Through-Penetration Fire Stops
ASTM E 1399	(1997; R 2000) Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems
ASTM E 1966	(2001) Fire-Resistive Joint Systems

## FM GLOBAL (FM)

FM P7825a	(2003) Approval Guide Fire Protection
FM Standard 4991	(2003) FM Contractor Approval Standard

## UNDERWRITERS LABORATORIES (UL)

UL 723	(1996; Rev thru Sep 2001) Test for Surface Burning Characteristics of Building Materials
UL 1479	(1994; Rev thru Aug 2000) Fire Tests of Through-Penetration Firestops
UL 2079	(1998) Tests for Fire Resistance of Building Joint Systems
UL Fire Resist Dir	(2003) Fire Resistance Directory (Vol 1, 2A, 2B & 3)

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G"



designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

##### Firestopping Materials; G-AE.

Detail drawings including manufacturer's descriptive data, typical details conforming to UL Fire Resist Dir or other details certified by another nationally recognized testing laboratory, installation instructions or UL listing details for a firestopping assembly in lieu of fire-test data or report. For those firestop applications for which no UL tested system is available through a manufacturer, a manufacturer's engineering judgement, derived from similar UL system designs or other tests, shall be submitted for review and approval prior to installation. Submittal shall indicate the firestopping material to be provided for each type of application. When more than a total of 5 penetrations and/or construction joints are to receive firestopping, provide drawings that indicate location, "F" and "T" ratings, and type of application.

#### SD-07 Certificates

##### Firestopping Materials.

Certificates attesting that firestopping material complies with the specified requirements. In lieu of certificates, drawings showing UL classified materials as part of a tested assembly may be provided. Drawings showing evidence of testing by an alternate nationally recognized independent laboratory may be substituted.

##### Installer Qualifications.

Documentation of training and experience.

##### Inspection.

Manufacturer's representative certification stating that firestopping work has been inspected and found to be applied according to the manufacturer's recommendations and the specified requirements.

### 1.3 GENERAL REQUIREMENTS

Firestopping shall consist of furnishing and installing tested and listed firestop systems, combination of materials, or devices to form an effective barrier against the spread of flame, smoke and gases, and maintain the integrity of fire resistance rated walls, partitions, floors, and ceiling-floor assemblies, including through-penetrations and construction joints and gaps. Through-penetrations include the annular space around pipes, tubes, conduit, wires, cables and vents. Construction joints include those used to accommodate expansion, contraction, wind, or seismic movement; firestopping material shall not interfere with the required movement of the joint. Gaps requiring firestopping include gaps between the curtain wall and the floor slab and between the top of the fire-rated walls and the roof or floor deck above.

#### 1.4 DELIVERY AND STORAGE

Materials shall be delivered in the original unopened packages or containers showing name of the manufacturer and the brand name. Materials shall be stored off the ground and shall be protected from damage and exposure to elements. Damaged or deteriorated materials shall be removed from the site.

#### 1.5 INSTALLER QUALIFICATIONS

The Contractor shall engage an experienced Installer who is:

- a. FM Research approved in accordance with FM Standard 4991, or
- b. Certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary staff, training, and a minimum of 3 years experience in the installation of manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an installer engaged by the Contractor does not in itself confer qualification on the buyer. The Installer shall have been trained by a direct representative of the manufacturer (not distributor or agent) in the proper selection and installation procedures.

#### 1.6 COORDINATION

The specified work shall be coordinated with other trades. Firestopping materials, at penetrations of pipes and ducts, shall be applied prior to insulating, unless insulation meets requirements specified for firestopping. Firestopping materials at building joints and construction gaps shall be applied prior to completion of enclosing walls or assemblies.

### PART 2 PRODUCTS

#### 2.1 FIRESTOPPING MATERIALS

Firestopping materials shall consist of commercially manufactured, asbestos-free, containing no water soluble intumescent ingredients, noncombustible products FM P7825a approved for use with applicable construction and penetrating items, complying with the following minimum requirements:

##### 2.1.1 Fire Hazard Classification

Material shall have a flame spread of 25 or less, and a smoke developed rating of 50 or less, when tested in accordance with ASTM E 84 or UL 723. Material shall be an approved firestopping material as listed in UL Fire Resist Dir or by a nationally recognized testing laboratory.

##### 2.1.2 Toxicity

Material shall be nontoxic to humans at all stages of application or during fire conditions.

##### 2.1.3 Fire Resistance Rating

Firestop systems shall be UL Fire Resist Dir listed or FM P7825a approved with "F" rating at least equal to fire-rating of fire wall or floor in

which penetrated openings are to be protected, except that "F" rating may be 3 hours in through-penetrations of 4 hour fire rated wall or floor. Firestop systems shall also have "T" rating where required.

#### 2.1.3.1 Through-Penetrations

Firestopping materials for through-penetrations, as described in paragraph GENERAL REQUIREMENTS, shall provide "F" and "T" fire resistance ratings in accordance with ASTM E 814 or UL 1479. Fire resistance ratings shall be as follows:

- a. Penetrations of Fire Resistance Rated Walls and Partitions: F Rating = Rating of wall or partition being penetrated.
- b. Penetrations of Fire Resistance Rated Ceiling Assemblies: F Rating = Rating of ceiling being penetrated.

#### 2.1.3.2 Construction Joints and Gaps

Fire resistance ratings of construction joints, as described in paragraph GENERAL REQUIREMENTS, and gaps such as those between floor slabs or roof decks and curtain walls shall be the same as the construction in which they occur. Construction joints and gaps shall be provided with firestopping materials and systems that have been tested per ASTM E 119, ASTM E 1966 or UL 2079 to meet the required fire resistance rating. Systems installed at construction joints shall meet the cycling requirements of ASTM E 1399 or UL 2079.

### PART 3 EXECUTION

#### 3.1 PREPARATION

Areas to receive firestopping shall be free of dirt, grease, oil, or loose materials which may affect the fitting or fire resistance of the firestopping system. Surfaces shall be prepared as recommended by the manufacturer.

#### 3.2 INSTALLATION

Firestopping material shall completely fill void spaces regardless of geometric configuration, subject to tolerance established by the manufacturer. Firestopping systems for filling floor voids 4 inches or more in any direction shall be capable of supporting the same load as the floor is designed to support or shall be protected by a permanent barrier to prevent loading or traffic in the firestopped area. Firestopping shall be installed in accordance with manufacturer's written instructions. Tested and listed firestop systems shall be provided in the following locations, except in floor slabs on grade:

- a. Penetrations of duct, conduit, tubing, cable and pipe through floors and through fire-resistance rated walls, partitions, and ceiling-floor assemblies.
- b. Penetrations of vertical shafts such as pipe chases, elevator shafts, and utility chutes.
- c. Gaps at perimeter of fire-resistance rated walls and partitions, such as between the top of the walls and the bottom of roof decks.

- d. Construction joints in floors and fire rated walls and partitions.
- e. Other locations where required to maintain fire resistance rating of the construction.

### 3.2.1 Insulated Pipes and Ducts

Thermal insulation shall be cut and removed where pipes or ducts pass through firestopping, unless insulation meets requirements specified for firestopping. Thermal insulation shall be replaced with a material having equal thermal insulating and firestopping characteristics.

### 3.2.2 Fire Dampers

Fire dampers shall be installed and firestopped in accordance with Section 15895 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM.

### 3.2.3 Data and Communication Cabling

Cabling for data and communication applications shall be sealed with re-enterable firestopping products that do not cure over time. Firestopping shall be modular devices, containing built-in self-sealing intumescent inserts. Firestopping devices shall allow for cable moves, adds or changes without the need to remove or replace any firestop materials.

## 3.3 INSPECTION

For all projects, the firestopped areas shall not be covered or enclosed until inspection is complete and approved by the manufacturer's technical representative. The manufacturer's representative shall inspect the applications initially to ensure adequate preparations (clean surfaces suitable for application, etc.) and periodically during the work to assure that the completed work has been accomplished according to the manufacturer's written instructions and the specified requirements. The Contractor shall submit written reports indicating locations of and types of penetrations and types of firestopping used at each location; type shall be recorded by UL listed printed numbers.

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SECTION 07920

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10/03

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## SECTION 07920

## JOINT SEALANTS

10/03

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM C 717	(2001) Standard Terminology of Building Seals and Sealants
ASTM C 734	(2001) Low-Temperature Flexibility of Latex Sealants After Artificial Weathering
ASTM C 919	(2002) Use of Sealants in Acoustical Applications
ASTM C 920	(2002) Elastomeric Joint Sealants
ASTM D 217	(1997) Cone Penetration of Lubricating Grease
ASTM E 84	(2001) Surface Burning Characteristics of Building Materials

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-03 Product Data

Sealants

Primers

Bond breakers

Backstops

Manufacturer's descriptive data including storage requirements, shelf life, curing time, instructions for mixing and application, and primer data (if required). A copy of the Material Safety Data Sheet shall be provided for each solvent, primer or sealant material.

## SD-07 Certificates

## Sealant

Certificates of compliance stating that the materials conform to the specified requirements.

## 1.3 ENVIRONMENTAL CONDITIONS

The ambient temperature shall be within the limits of 40 and 90 degrees F when sealant is applied.

## 1.4 DELIVERY AND STORAGE

Deliver materials to the job site in unopened manufacturers' external shipping containers, with brand names, date of manufacture, color, and material designation clearly marked thereon. Elastomeric sealant containers shall be labeled to identify type, class, grade, and use. Carefully handle and store materials to prevent inclusion of foreign materials or subjection to sustained temperatures exceeding 90 degrees F or less than 0 degrees F.

## PART 2 PRODUCTS

## 2.1 SEALANTS

Provide sealant that has been tested and found suitable for the substrates to which it will be applied. Color selection from manufacturer's standard selection unless otherwise noted.

## 2.1.1 Interior Sealant

ASTM C 920, Type S or M, Grade NS, Class 12.5, Use NT. Location(s) and color(s) of sealant shall be as follows:

LOCATION	COLOR
a. Small voids between walls or partitions and adjacent lockers, casework, shelving, door frames, built-in or surface-mounted equipment and fixtures, and similar items.	As selected
b. Perimeter of frames at doors, windows, and access panels which adjoin exposed interior concrete and masonry surfaces.	As selected
c. Joints of interior masonry walls and partitions which adjoin columns, pilasters, concrete walls, and exterior walls unless otherwise detailed.	As selected
d. Joints between edge members for acoustical tile and adjoining vertical surfaces.	As selected
e. Interior locations, not otherwise indicated or specified, where small voids exist between materials specified to be painted.	As selected
f. Joints between	As selected

LOCATION	COLOR
shower receptors and ceramic tile; joints formed where nonplaner tile surfaces meet.	
g. Joints formed between tile floors and tile base cove; joints between tile and dissimilar materials; joints occuring where substrates change.	As selected
h. Behind escutcheon plates at valve pipe penetrations and showerheads in showers.	As selected

#### 2.1.2 Exterior Sealant

For joints in vertical surfaces, provide ASTM C 920, Type S or M, Grade NS, Class 25, Use NT. For joints in horizontal surfaces, provide ASTM C 920, Type S or M, Grade P, Class 25, Use T. Location(s) and color(s) of sealant shall be as follows:

LOCATION	COLOR
a. Joints and recesses formed where frames and subsills of windows, doors, louvers, and vents adjoin masonry, concrete, or metal frames. Use sealant at both exterior and interior surfaces of exterior wall penetrations.	As selected
b. Joints between exterior masonry walls.	As selected
d. Expansion and control joints.	As selected
e. Interior face of expansion joints in exterior concrete or masonry walls where metal expansion joint covers are not required.	As selected
f. Voids where items pass through exterior walls.	As selected
g. Metal reglets, where flashing is inserted into masonry joints	As selected
h. Metal-to-metal joints where sealant is indicated or specified.	As selected
i. Joints between ends of fascias, copings, and adjacent walls.	As selected
j. Structural silicone sealant on perimeter of each window, both sides.	Gray to match window framing system

#### 2.1.3 Floor Joint Sealant

ASTM C 920, Type S or M, Grade P, Class 25, Use T. Location(s) and color(s) of sealant shall be as follows:



LOCATION	COLOR
a. Seats of metal thresholds for exterior doors.	As selected
b. Control and expansion joints in floors, slabs, ceramic tile, and walkways.	As selected

#### 2.1.4 Acoustical Sealant

Rubber or polymer-based acoustical sealant conforming to ASTM C 919 shall have a flame spread of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E 84. Acoustical sealant shall have a consistency of 250 to 310 when tested in accordance with ASTM D 217, and shall remain flexible and adhesive after 500 hours of accelerated weathering as specified in ASTM C 734, and shall be non-staining.

#### 2.1.5 Preformed Sealant

Preformed sealant shall be polybutylene or isoprene-butylene based pressure sensitive weather resistant tape or bead sealant capable of sealing out moisture, air and dust when installed as recommended by the manufacturer. At temperatures from minus 30 to plus 160 degrees F, the sealant shall be non-bleeding and shall have no loss of adhesion.

#### 2.2 PRIMERS

Provide a nonstaining, quick-drying type and consistency recommended by the sealant manufacturer for the particular application.

#### 2.3 BOND BREAKERS

Provide the type and consistency recommended by the sealant manufacturer to prevent adhesion of the sealant to backing or to bottom of the joint.

#### 2.4 BACKSTOPS

Provide glass fiber roving or neoprene, butyl, polyurethane, or polyethylene foams free from oil or other staining elements as recommended by sealant manufacturer. Backing shall be 25 to 33 percent oversize for closed cell and 40 to 50 percent oversize for open cell material, unless otherwise indicated. Backstop material shall be compatible with sealant. Do not use oakum and other types of absorptive materials as backstops.

##### 2.4.1 Bi-cellular Material

Bi-cellular backing shall be ASTM C 717, Type B, round cross section.

#### 2.5 CLEANING SOLVENTS

Provide type(s) recommended by the sealant manufacturer.

### PART 3 EXECUTION

#### 3.1 SURFACE PREPARATION

Surfaces shall be clean, dry to the touch, and free from dirt frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter that

would tend to destroy or impair adhesion. Oil and grease shall be removed with solvent and surfaces shall be wiped dry with clean cloths. When resealing an existing joint, remove existing calk or sealant prior to applying new sealant. For surface types not listed below, the sealant manufacturer shall be contacted for specific recommendations.

### 3.1.1 Steel Surfaces

Remove loose mill scale by sandblasting or, if sandblasting is impractical or would damage finish work, scraping and wire brushing. Remove protective coatings by sandblasting or using a residue-free solvent.

### 3.1.2 Aluminum Surfaces

Remove temporary protective coatings from surfaces that will be in contact with sealant. When masking tape is used as a protective coating, remove tape and any residual adhesive just prior to sealant application. For removing protective coatings and final cleaning, use nonstaining solvents recommended by the manufacturer of the item(s) containing aluminum or bronze surfaces.

### 3.1.3 Concrete and Masonry Surfaces

Where surfaces have been treated with curing compounds, oil, or other such materials, the materials shall be removed by sandblasting or wire brushing. Laitance, efflorescence and loose mortar shall be removed from the joint cavity.

## 3.2 SEALANT PREPARATION

Do not add liquids, solvents, or powders to the sealant. Mix multicomponent elastomeric sealants in accordance with manufacturer's instructions.

## 3.3 APPLICATION

### 3.3.1 Joint Width-To-Depth Ratios

#### a. Acceptable Ratios:

<u>JOINT WIDTH</u>	<u>JOINT DEPTH</u>	
	Minimum	Maximum
For metal, glass, or other nonporous surfaces:		
1/4 inch (minimum)	1/4 inch	1/4 inch
over 1/4 inch	1/2 of width	Equal to width
For concrete or masonry:		
1/4 inch (minimum)	1/4 inch	1/4 inch
Over 1/4 inch to 1/2 inch	1/4 inch	Equal to width
Over 1/2 inch to 2 inches	1/2 inch	5/8 inch
Over 2 inches	(As recommended by sealant manufacturer)	

JOINT WIDTHJOINT DEPTH

Minimum                      Maximum

- b. Unacceptable Ratios: Where joints of acceptable width-to-depth ratios have not been provided, clean out joints to acceptable depths and grind or cut to acceptable widths without damage to the adjoining work. Grinding shall not be required on metal surfaces.

## 3.3.2 Masking Tape

Masking tape may be placed on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or sealant smears. Masking tape shall be removed within 10 minutes after joint has been filled and tooled.

## 3.3.3 Backstops

Install backstops dry and free of tears or holes. Tightly pack the back or bottom of joint cavities with backstop material to provide a joint of the depth specified. Install backstops in the following locations:

- a. Where indicated.
- b. Where backstop is not indicated but joint cavities exceed the acceptable maximum depths specified in paragraph entitled, "Joint Width-to-Depth Ratios."

## 3.3.4 Primer

Immediately prior to application of the sealant, clean out loose particles from joints. Where recommended by sealant manufacturer, apply primer to joints in concrete masonry units, wood, and other porous surfaces in accordance with sealant manufacturer's instructions. Do not apply primer to exposed finish surfaces.

## 3.3.5 Bond Breaker

Provide bond breakers to the back or bottom of joint cavities, as recommended by the sealant manufacturer for each type of joint and sealant used, to prevent sealant from adhering to these surfaces. Carefully apply the bond breaker to avoid contamination of adjoining surfaces or breaking bond with surfaces other than those covered by the bond breaker.

## 3.3.6 Sealants

Provide a sealant compatible with the material(s) to which it is applied. Do not use a sealant that has exceeded shelf life or has jelled and can not be discharged in a continuous flow from the gun. Apply the sealant in accordance with the manufacturer's instructions with a gun having a nozzle that fits the joint width. Force sealant into joints to fill the joints solidly without air pockets. Tool sealant after application to ensure adhesion. Sealant shall be uniformly smooth and free of wrinkles. Upon completion of sealant application, roughen partially filled or unfilled joints, apply sealant, and tool smooth as specified. Sealer shall be applied over the sealant when and as specified by the sealant manufacturer.

### 3.4 PROTECTION AND CLEANING

#### 3.4.1 Protection

Protect areas adjacent to joints from sealant smears. Masking tape may be used for this purpose if removed 5 to 10 minutes after the joint is filled.

#### 3.4.2 Final Cleaning

Upon completion of sealant application, remove remaining smears and stains and leave the work in a clean and neat condition.

- a. Masonry and Other Porous Surfaces: Immediately scrape off fresh sealant that has been smeared on masonry and rub clean with a solvent as recommended by the sealant manufacturer. Allow excess sealant to cure for 24 hour then remove by wire brushing or sanding.
- b. Metal and Other Non-Porous Surfaces: Remove excess sealant with a solvent-moistened cloth.

-- End of Section --

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SECTION 08110

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## SECTION 08110

## STEEL DOORS AND FRAMES

05/01

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- |             |  |
|-------------|--|
| ANSI A250.4 | (1994) Test Procedure and Acceptance<br>Criteria for Physical Endurance for Steel<br>Doors and Hardware Reinforcings |
| ANSI A250.6 | (1997) Hardware on Standard Steel Doors<br>(Reinforcement - Application)   |
| SDI A250.8  | (1998) SDI-100 Recommended Specifications<br>for Standard Steel Doors and Frames                                     |

## ASTM INTERNATIONAL (ASTM)

- |                   |   |
|-------------------|---|
| ASTM A 591        | (1998) Steel Sheet, Electrolytic<br>Zinc-Coated, for Light Coating Mass<br>Applications                             |
| ASTM A 653/A 653M | (2002a) Steel Sheet, Zinc-Coated<br>(Galvanized) or Zinc-Iron Alloy-Coated<br>(Galvannealed) by the Hot-Dip Process |
| ASTM A 924/A 924M | (1999) General Requirements for Steel<br>Sheet, Metallic-Coated by the Hot-Dip<br>Process                           |

## BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

- |           |   |
|-----------|---|
| BHMA A115 | (1991) Steel Door Preparation Standards<br>(Consisting of A115.1 through A115.6 and<br>A115.12 through A115.18) |
|-----------|---|

## NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

- |                |                            |
|----------------|----------------------------|
| NAAMM HMMA HMM | (1992) Hollow Metal Manual |
|----------------|----------------------------|

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- |          |   |
|----------|---|
| NFPA 80  | (1999) Fire Doors and Fire Windows                      |
| NFPA 105 | (2003) Installation of Smoke-Control Door<br>Assemblies |

NFPA 252 (1999) Fire Tests of Door Assemblies

STEEL DOOR INSTITUTE (SDI)

SDI 105 (1998) Recommended Erection Instructions  
for Steel Frames

SDI 111-F Recommended Existing Wall Anchors for  
Standard Steel Doors and Frames

UNDERWRITERS LABORATORIES (UL)

UL 10B (1997) Fire Tests of Door Assemblies

## 1.2 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

### SD-02 Shop Drawings

Doors; G-AE

Frames; G-AE

Show elevations, construction details, metal gages, hardware provisions, method of glazing, and installation details.

Schedule of doors; G-AE

Schedule of frames; G-AE

Submit door and frame locations.

### SD-03 Product Data

Doors; G-AE

Frames; G-AE

Submit manufacturer's descriptive literature for doors, frames, and accessories. Include data and details on door construction, panel (internal) reinforcement, insulation, and door edge construction. When "custom hollow metal doors" are provided in lieu of "standard steel doors," provide additional details and data sufficient for comparison to SDI A250.8 requirements.

## 1.3 DELIVERY, STORAGE, AND HANDLING

Deliver doors, frames, and accessories undamaged and with protective wrappings or packaging. Provide temporary steel spreaders securely fastened to the bottom of each welded frame. Store doors and frames on platforms under cover in clean, dry, ventilated, and accessible locations, with 1/4 inch airspace between doors. Remove damp or wet packaging immediately and wipe affected surfaces dry. Replace damaged materials with new.

## PART 2 PRODUCTS

### 2.1 STANDARD STEEL DOORS

SDI A250.8, except as specified otherwise. Prepare doors to receive hardware specified in Section 08710, "Door Hardware." Undercut where indicated. Exterior doors shall have top edge closed flush and sealed to prevent water intrusion. Doors shall be 1 3/4 inches thick, unless otherwise indicated.

#### 2.1.1 Classification - Level, Performance, Model

##### 2.1.1.1 Heavy Duty Doors

SDI A250.8, Level 2, physical performance Level B, Model 1, with core construction as required by the manufacturer for interior doors of size(s) and design(s) indicated. Where vertical stiffener cores are required, the space between the stiffeners shall be filled with mineral board insulation.

### 2.2 CUSTOM HOLLOW METAL DOORS

Provide custom hollow metal doors where nonstandard steel doors are indicated. At the Contractor's option, custom hollow metal doors may be provided in lieu of standard steel doors. Door size(s), design, materials, construction, gages, and finish shall be as specified for standard steel doors and shall comply with the requirement of NAAMM HMMA HMM. Fill all spaces in doors with insulation. Close top and bottom edges with steel channels not lighter than 16 gage. Prepare doors to receive hardware specified in Section 08710, "Door Hardware." Undercut doors where indicated. Doors shall be 1 3/4 inches thick, unless otherwise indicated.

### 2.3 INSULATED STEEL DOOR AND FRAME

Insulated steel doors shall have a core of polyurethane foam and an R factor of 10.0 or more (based on a k value of 0.16); face sheets, edges, and frames of galvanized steel not lighter than 16 gage, 16 gage, and 14 gage respectively. Doors and frames shall receive phosphate treatment, rust-inhibitive primer. Doors shall have been tested in accordance with ANSI A250.4 and shall have met the requirements for Level C. Prepare doors to receive hardware specified in Section 08710, "Door Hardware." Doors shall be 1 3/4 inches thick. Provide insulated steel doors and frames where shown.

### 2.4 STANDARD STEEL FRAMES

SDI A250.8, except as otherwise specified. Form frames to sizes and shapes indicated, with welded corners. Provide steel frames for doors and transoms unless otherwise indicated.

#### 2.4.1 Welded Frames

Continuously weld frame faces at corner joints. Mechanically interlock or continuously weld stops and rabbets. Grind welds smooth.

#### 2.4.2 Transom Bars

Transom bars shall be closed or tubular construction and shall member with jambs butt-welded thereto.



#### 2.4.3 Stops and Beads

Form stops and beads from 20 gage steel. Provide for glazed and other openings in standard steel frames. Secure beads to frames with oval-head, countersunk Phillips self-tapping sheet metal screws or concealed clips and fasteners. Space fasteners approximately 12 to 16 inches on centers. Miter molded shapes at corners. Butt or miter square or rectangular beads at corners.

#### 2.4.4 Anchors

Provide anchors to secure the frame to adjoining construction. Provide steel anchors, zinc-coated or painted with rust-inhibitive paint, not lighter than 18 gage.

##### 2.4.4.1 Wall Anchors

Provide at least three anchors for each jamb. For frames which are more than 7.5 feet in height, provide one additional anchor for each jamb for each additional 2.5 feet or fraction thereof.

- a. Masonry: Provide anchors of corrugated or perforated steel straps or 3/16 inch diameter steel wire, adjustable or T-shaped;
- b. Stud partitions: Weld or otherwise securely fasten anchors to backs of frames. Design anchors to be fastened to closed steel studs with sheet metal screws, and to open steel studs by wiring or welding;
- c. Completed openings: Secure frames to previously placed concrete or masonry with expansion bolts in accordance with SDI 111-F.

##### 2.4.4.2 Floor Anchors

Provide floor anchors drilled for 3/8 inch anchor bolts at bottom of each jamb member. Where floor fill occurs, terminate bottom of frames at the indicated finished floor levels and support by adjustable extension clips resting on and anchored to the structural slabs.

#### 2.5 FIRE AND SMOKE DOORS AND FRAMES

NFPA 80 and NFPA 105 and this specification. The requirements of NFPA 80 and NFPA 105 shall take precedence over details indicated or specified.

##### 2.5.1 Labels

Fire doors and frames shall bear the label of Underwriters Laboratories (UL), Factory Mutual Engineering and Research (FM), or Warnock Hersey International (WHI) attesting to the rating required. Testing shall be in accordance with NFPA 252 or UL 10B. Labels shall be metal with raised letters, and shall bear the name or file number of the door and frame manufacturer. Labels shall be permanently affixed at the factory to frames and to the hinge edge of the door. Door labels shall not be painted.

#### 2.6 WEATHERSTRIPPING

As specified in Section 08710, "Door Hardware."

## 2.7 HARDWARE PREPARATION

Provide minimum hardware reinforcing gages as specified in ANSI A250.6. Drill and tap doors and frames to receive finish hardware. Prepare doors and frames for hardware in accordance with the applicable requirements of SDI A250.8 and ANSI A250.6. For additional requirements refer to BHMA A115.

Drill and tap for surface-applied hardware at the project site. Build additional reinforcing for surface-applied hardware into the door at the factory. Locate hardware in accordance with the requirements of SDI A250.8, as applicable. Punch door frames to receive a minimum of two rubber or vinyl door silencers on lock side of single doors and one silencer for each leaf at heads of double doors. Set lock strikes out to provide clearance for silencers.

## 2.8 FINISHES

### 2.8.1 Factory-Primed Finish

All surfaces of doors and frames shall be thoroughly cleaned, chemically treated and factory primed with a rust inhibiting coating as specified in SDI A250.8, or paintable A25 galvanized steel without primer. Where coating is removed by welding, apply touchup of factory primer.

### 2.8.2 Hot-Dip Zinc-Coated and Factory-Primed Finish

Fabricate exterior doors and frames from hot dipped zinc coated steel, alloyed type, that complies with ASTM A 924/A 924M and ASTM A 653/A 653M. The Coating weight shall meet or exceed the minimum requirements for coatings having 0.4 ounces per square foot, total both sides, i.e., A40. Repair damaged zinc-coated surfaces by the application of zinc dust paint. Thoroughly clean and chemically treat to insure maximum paint adhesion. Factory prime as specified in SDI A250.8.

### 2.8.3 Electrolytic Zinc-Coated Anchors and Accessories

Provide electrolytically deposited zinc-coated steel in accordance with ASTM A 591, Commercial Quality, Coating Class A. Phosphate treat and factory prime zinc-coated surfaces as specified in SDI A250.8.

## 2.9 FABRICATION AND WORKMANSHIP

Finished doors and frames shall be strong and rigid, neat in appearance, and free from defects, waves, scratches, cuts, dents, ridges, holes, warp, and buckle. Molded members shall be clean cut, straight, and true, with joints coped or mitered, well formed, and in true alignment. Dress exposed welded and soldered joints smooth. Design door frame sections for use with the wall construction indicated. Corner joints shall be well formed and in true alignment. Conceal fastenings where practicable. Design frames in exposed masonry walls or partitions to allow sufficient space between the inside back of trim and masonry to receive calking compound.

### 2.9.1 Grouted Frames

For frames to be installed in exterior walls and to be filled with mortar or grout, fill the stops with strips of rigid insulation to keep the grout out of the stops and to facilitate installation of stop-applied head and jamb seals.

## PART 3 EXECUTION

### 3.1 INSTALLATION

#### 3.1.1 Frames

Set frames in accordance with SDI 105. Plumb, align, and brace securely until permanent anchors are set. Anchor bottoms of frames with expansion bolts or powder-actuated fasteners. Build in or secure wall anchors to adjoining construction. Backfill frames in masonry partitions with mortar.

When an additive is provided in the mortar, coat inside of frames with corrosion-inhibiting bituminous material. For frames in exterior walls, ensure that stops are filled with rigid insulation before grout is placed.

#### 3.1.2 Doors

Hang doors in accordance with clearances specified in SDI A250.8. After erection and glazing, clean and adjust hardware.

#### 3.1.3 Fire and Smoke Doors and Frames

Install fire doors and frames, including hardware, in accordance with NFPA 80. Install fire rated smoke doors and frames in accordance with NFPA 80 and NFPA 105.

### 3.2 PROTECTION

Protect doors and frames from damage. Repair damaged doors and frames prior to completion and acceptance of the project or replace with new, as directed. Wire brush rusted frames until rust is removed. Clean thoroughly. Apply an all-over coat of rust-inhibitive paint of the same type used for shop coat.

### 3.3 CLEANING

Upon completion, clean exposed surfaces of doors and frames thoroughly. Remove mastic smears and other unsightly marks.

-- End of Section --

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SECTION 08120

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## SECTION 08120

## ALUMINUM DOORS AND FRAMES

09/99

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## ALUMINUM ASSOCIATION (AA)

AA DAF-45 (1997) Designation System for Aluminum Finishes

## ASTM INTERNATIONAL (ASTM)

ASTM A 36/A 36M (2001) Carbon Structural Steel

ASTM B 209 (2002a) Aluminum and Aluminum-Alloy Sheet and Plate

ASTM B 221 (2002) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

ASTM C 1184 (2000ae1) Structural Silicone Sealants

ASTM C 1401 (2002) Structural Sealant Glazing

ASTM E 283 (1991; R 1999) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

ASTM E 331 (2000) Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

## U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 4-010-01 (8 October 2003) Unified Facilities Criteria DoD Minimum Antiterrorism Standards for Buildings.

## 1.2 PERFORMANCE REQUIREMENTS

## 1.2.1 Structural

## 1.2.1.1 General Performance

Shapes and thicknesses of all framing members, fasteners and hardware shall comply with UFC 4-010-01.

#### 1.2.1.2 Frame Member Design

Steel members shall be designed using ultimate yield stresses and aluminum members shall be designed on a 0.2% offset yield strength. Equivalent static design loads for the window and door members shall be 1 lb per square inch applied to the surface of the glazing and frame. Deformations shall not exceed 1/60th of the unsupported member lengths.

#### 1.2.1.3 Glazing Frame Bite

The glazing shall have a minimum frame bite for installation of 3/8 inch for structurally glazed systems.

#### 1.2.1.4 Connection Design

Equivalent static design loads for connections of the window or doorframe to the surrounding walls associated connections and glazing stop connections shall be 10.8 lbs per square inch for glazing panels with a vision area less than or equal to 10.8 square feet and 4.4 lbs per square inch or glazing panels with a vision area greater than 10.8 square feet but less than or equal to 32 square feet. Loads shall be applied to the surface of the glazing and frame. Connections and hardware may be designed on ultimate strength for steel and 0.2% offset yield strength for aluminum.

#### 1.2.2 Air Infiltration

When tested in accordance with ASTM E 283, air infiltration shall not exceed 0.06 cubic feet per minute per square foot of fixed area at a test pressure of 6.24 pounds per square foot (50 mile per hour wind).

#### 1.2.3 Water Penetration

When tested in accordance with ASTM E 331, there shall be no water penetration at a pressure of 8 pounds per square foot of fixed area.

### 1.3 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

#### SD-02 Shop Drawings

Doors and frames; G-AE

Show elevations of each door type, size of doors and frames, metal gages, details of door and frame construction, methods of anchorage, glazing details, weatherstripping, provisions for and location of hardware, and details of installation.

#### SD-07 Certificates

Aluminum Door System Design; G-AE

Certificates stating that the door system framing comply with the requirements of UFC 4-010-01. Certification includes design of door framing design and accessories, and glazing design to comply with specified loads.



## SD-08 Manufacturer's Instructions

## Doors and frames

Submit detail specifications and instructions for installation, adjustments, cleaning, and maintenance.

## 1.4 DELIVERY, STORAGE, AND HANDLING

Inspect materials delivered to the site for damage. Unload and store with minimum handling. Provide storage space in dry location with adequate ventilation, free from dust or water, and easily accessible for inspection and handling. Stack materials on nonabsorptive strips or wood platforms. Do not cover doors and frames with tarps, polyethylene film, or similar coverings. Protect finished surfaces during shipping and handling using manufacturer's standard method, except that no coatings or lacquers shall be applied to surfaces to which calking and glazing compounds must adhere.

## PART 2 PRODUCTS

## 2.1 DOORS AND FRAMES

Swing-type aluminum doors and frames of size, design, and location indicated. Provide doors complete with frames, framing members, subframes, transoms, adjoining sidelights, trim, permanent mullions, and accessories. Provide door framing compatible with glazed curtain wall assembly members.

## 2.2 MATERIALS

## 2.2.1 Anchors

Stainless steel or steel with hot-dipped galvanized finish.

## 2.2.2 Weatherstripping

Continuous wool pile, silicone treated, or type recommended by door manufacturer.

## 2.2.3 Aluminum Alloy for Doors and Frames

ASTM B 221, Alloy 6063-T5 for extrusions. ASTM B 209, alloy and temper best suited for aluminum sheets and strips.

## 2.2.4 Fasteners

Hard aluminum or stainless steel.

## 2.2.5 Structural Steel

ASTM A 36/A 36M.

## 2.2.6 Aluminum Paint

Type as recommended by aluminum door manufacturer.

## 2.3 FABRICATION

### 2.3.1 Aluminum Frames

Extruded aluminum shapes with contours approximately as indicated. Provide glazing accessories for frames accommodating structural silicone glazed fixed glass. Use countersunk stainless steel Phillips screws for exposed fastenings, and space not more than 12 inches o.c. Mill joints in frame members to a hairline fit, reinforce, and secure mechanically.

### 2.3.2 Aluminum Door System Design

Of type, size, and design indicated and not less than 1 3/4 inches thick. Minimum wall thickness, 0.125 inch, except beads and trim, 0.050 inch. Door sizes shown are nominal and shall include standard clearances as follows: 0.093 inch at hinge and lock stiles, 0.125 inch between meeting stiles, 0.125 inch at top rails, 0.187 inch between bottom and threshold, and 0.687 inch between bottom and floor. Bevel single-acting doors 0.063 or 0.125 inch at lock, hinge, and meeting stile edges. Provide system manufacturer's standard permanent mullions and hardware compliant to design requirements.

#### 2.3.2.1 Full Glazed Stile and Rail Doors

Doors shall have wide stiles and rails as indicated. Fabricate from extruded aluminum hollow seamless tubes or from a combination of open-shaped members interlocked or welded together. Fasten top and bottom rail together by means of welding or by 3/8 or 1/2 inch diameter cadmium-plated tensioned steel tie rods. Provide an adjustable mechanism of jack screws or other methods in the top rail to allow for minor clearance adjustments after installation. Install wet glazing system with ASTM C 1184 compliant silicone sealant. Color: gray to match framing system. Use same sealant and color on glazed curtain wall.

### 2.3.3 Welding and Fastening

Where possible, locate welds on unexposed surfaces. Dress welds on exposed surfaces smoothly. Select welding rods, filler wire, and flux to produce a uniform texture and color in finished work. Remove flux and spatter from surfaces immediately after welding. Exposed screws or bolts will be permitted only in inconspicuous locations, and shall have countersunk heads. Weld concealed reinforcements for hardware in place.

### 2.3.4 Weatherstripping

Provide on stiles and rails of exterior doors. Fit into slots which are integral with doors or frames. Weatherstripping shall be replaceable without special tools, and adjustable at meeting rails of pairs of doors. Installation shall allow doors to swing freely and close positively. Air leakage of a single leaf weatherstripped door shall not exceed 1.25 cubic feet per minute of air per square foot of door area when tested in accordance with ASTM E 283.

### 2.3.5 Anchors

On the backs of subframes, provide anchors of the sizes and shapes indicated for securing subframes to adjacent construction. Anchor transom bars at ends and mullions at head and sill. Where indicated, reinforce vertical mullions with structural steel members of sufficient length to extend up to the overhead structural slab or framing and secure thereto.

Reinforce and anchor freestanding door frames to floor construction as indicated on approved shop drawings and in accordance with manufacturer's recommendation. Place anchors near top and bottom of each jamb and at intermediate points not more than 25 inches apart.

#### 2.3.6 Provisions for Hardware

Hardware is specified in Section 08710, "Door Hardware." Deliver hardware templates and hardware (except field-applied hardware) to the door manufacturer for use in fabrication of aluminum doors and frames. Cut, reinforce, drill, and tap doors and frames at the factory to receive template hardware. Provide doors to receive surface-applied hardware, except push plates and kick plates with reinforcing only; drill and tap in the field. Provide hardware reinforcements of stainless steel or steel with hot-dipped galvanized finish, and secure with stainless steel screws.

#### 2.3.7 Provisions for Glazing

Provide manufactured metallic glazing beads and accessories to allow for structural silicone glazing of glazing materials. Design glazing beds to receive glass of thickness indicated or specified. Glazing is specified in Section 08800 GLAZING.

#### 2.3.8 Finishes

Provide exposed aluminum surfaces with factory finish of anodic coating.

##### 2.3.8.1 Anodic Coating

Clean exposed aluminum surfaces and provide an anodized finish conforming to AA DAF-45. Finish shall be clear (natural), designation AA-M10-C22-A41, Architectural Class I 0.7 mil or thicker).

### PART 3 EXECUTION

#### 3.1 INSTALLATION

##### 3.1.1 Door and Frame Installation

Plumb, square, level, and align frames and framing members to receive doors, transoms, adjoining sidelights and permanent mullions. Anchor frames to adjacent glazed curtain wall construction as indicated and in accordance with manufacturer's printed instructions. See Section 08900 GLAZED CURTAIN WALL for curtain wall assembly. Anchor bottom of each frame to rough floor construction with 3/32 inch thick stainless steel angle clips secured to back of each jamb and to floor construction; use stainless steel bolts and expansion rivets for fastening clip anchors. Seal metal-to-metal joints between framing members as specified in Section 07920 JOINT SEALANTS. Hang doors to produce clearances specified in paragraph entitled "Aluminum Doors," of this section. After erection and glazing, adjust doors and hardware to operate properly.

##### 3.1.2 Glazing Installation

Install glazing in a wet glazed system in compliance with ASTM C 1401 using an ASTM C 1184 structural silicone sealant.

### 3.2 PROTECTION FROM DISSIMILAR MATERIALS

#### 3.2.1 Dissimilar Metals

Where aluminum surfaces come in contact with metals other than stainless steel, zinc, or small areas of white bronze, protect from direct contact by one or a combination of the following methods:

- a. Paint the dissimilar metal with one coat of heavy-bodied bituminous paint.
- b. Apply a good quality elastomeric sealant between the aluminum and the dissimilar metal.
- c. Paint the dissimilar metal with one coat of primer and one coat of aluminum paint.
- d. Use a nonabsorptive tape or gasket in permanently dry locations.

#### 3.2.2 Drainage from Dissimilar Metals

In locations where drainage from dissimilar metals has direct contact with aluminum, provide protective paint, to prevent aluminum discoloration.

#### 3.2.3 Masonry and Concrete

Provide aluminum surfaces in contact with mortar, concrete, or other masonry materials with one coat of heavy-bodied bituminous paint.

#### 3.2.4 Wood or Other Absorptive Materials

Provide aluminum surfaces in contact with absorptive materials subject to frequent moisture, and aluminum surfaces in contact with treated wood, with two coats of aluminum paint or one coat of heavy-bodied bituminous paint. In lieu of painting the aluminum, the Contractor shall have the option of painting the wood or other absorptive surface with two coats of aluminum paint and sealing the joints with elastomeric sealant.

### 3.3 CLEANING

Upon completion of installation, clean door and frame surfaces in accordance with door manufacturer's recommended procedure. Do not use abrasive, caustic, or acid cleaning agents.

### 3.4 PROTECTION

Protect doors and frames from damage and from contamination by other materials such as cement mortar. Prior to completion and acceptance of the work, restore damaged doors and frames to original condition, or replace with new ones.

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## SECTION 08210

## WOOD DOORS

09/99

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM E 152 (1981ae2) Fire Tests of Door Assemblies

## ARCHITECTURAL WOODWORK INSTITUTE (AWI)

AWI Qual Stds (1999) AWI Quality Standards

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80 (1999) Fire Doors and Fire Windows

NFPA 252 (1999) Fire Tests of Door Assemblies

## WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

WDMA I.S. 1-A (1997) Architectural Wood Flush Doors

WDMA TM-5 (1990) Split Resistance Test

WDMA TM-7 (1990) Cycle - Slam Test

WDMA TM-8 (1990) Hinge Loading Resistance Test

## UNDERWRITERS LABORATORIES (UL)

UL 10B (1997) Fire Tests of Door Assemblies

## 1.2 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

## SD-02 Shop Drawings

Doors; G-AE

Submit drawings or catalog data showing each type of door unit . Drawings and data shall indicate door and frame type and construction, sizes, and thickness.

## SD-03 Product Data

Doors; G-AE

Accessories

Water-resistant sealer

Sample warranty

Fire resistance rating; G-AE

#### SD-04 Samples

Door finish colors; G-AE

Submit a minimum of three color selection samples .

#### SD-06 Test Reports

Split resistance

Cycle-slam

Hinge loading resistance

Submit split resistance test report for doors tested in accordance with WDMA TM-5, cycle-slam test report for doors tested in accordance with WDMA TM-7, and hinge loading resistance test report for doors tested in accordance with WDMA TM-8.

### 1.3 DELIVERY, STORAGE, AND HANDLING

Deliver doors to the site in an undamaged condition and protect against damage and dampness. Stack doors flat under cover. Support on blocking, a minimum of 4 inches thick, located at each end and at the midpoint of the door. Store doors in a well-ventilated building so that they will not be exposed to excessive moisture, heat, dryness, direct sunlight, or extreme changes of temperature and humidity. Do not store in a building under construction until concrete, masonry work, and other wet activities are dry. Replace defective or damaged doors with new ones.

### 1.4 WARRANTY

Warranty shall warrant doors free of defects as set forth in the door manufacturer's standard door warranty.

## PART 2 PRODUCTS

### 2.1 DOORS

Provide doors of the types, sizes, designs, and door finish colors indicated.

#### 2.1.1 Flush Doors

Flush doors shall conform to WDMA I.S. 1-A. Stile edge bands of doors to receive natural finish shall be hardwood, compatible with face veneer. No visible finger joints will be accepted in stile edge bands. When used, locate finger-joints under hardware.

#### 2.1.1.1 Interior Flush Doors

Provide particleboard core, Type II flush doors conforming to WDMA I.S. 1-A with faces of premium grade red oak . Hardwood veneers shall be plain slicedbook matched .

#### 2.1.2 Composite-Type Fire Doors

Doors specified or indicated to have a fire resistance rating shall conform to the requirements of UL 10B, ASTM E 152, or NFPA 252 for the class of door indicated. Affix a permanent metal label with raised or incised markings indicating testing agency's name and approved hourly fire rating to hinge edge of each door.

### 2.2 ACCESSORIES

#### 2.2.1 Additional Hardware Reinforcement

Provide fire rated doors with hardware reinforcement blocking. Size of lock blocks shall be as required to secure the hardware specified. Top, bottom and intermediate rail blocks shall measure 5 inches minimum by full core width. Reinforcement blocking shall be in compliance with the manufacturer's labeling requirements and shall not be mineral material similar to the core.

### 2.3 FABRICATION

#### 2.3.1 Marking

Each door shall bear a stamp, brand, or other identifying mark indicating quality and construction of the door.

#### 2.3.2 Quality and Construction

Identify the standard on which the construction of the door was based .

#### 2.3.3 Adhesives and Bonds

WDMA I.S. 1-A. Use Type II bond for interior doors. Adhesive for doors to receive a natural finish shall be nonstaining.

#### 2.3.4 Prefitting

At the Contractor's option, doors may be provided factory pre-fit. Doors shall be sized and machined at the factory by the door manufacturer in accordance with the standards under which they are produced. The work shall include sizing, bevelling edges, mortising, and drilling for hardware and providing necessary beaded openings for glass. Provide the door manufacturer with the necessary hardware samples, and frame and hardware schedules as required to coordinate the work.

#### 2.3.5 Finishes

##### 2.3.5.1 Factory Finish

Provide doors finished at the factory by the door manufacturer as follows: AWI Qual Stds Section 1500, specification for System No. 4 Conversion varnish alkyd urea or System No. 5 Vinyl catalyzed. The coating shall be AWI Qual Stds premium, medium rubbed sheen, open grain effect. Use stain



when required to produce the finish specified for color. Seal edges, cutouts, trim, and wood accessories, and apply two coats of finish compatible with the door face finish. Touch-up finishes that are scratched or marred, or where exposed fastener holes are filled, in accordance with the door manufacturer's instructions. Match color and sheen of factory finish using materials compatible for field application. For door finish colors see Section 09915 COLOR SCHEDULE.

#### 2.3.6 Water-Resistant Sealer

Provide a water-resistant sealer compatible with the specified finish as approved and as recommended by the door manufacturer.

#### 2.4 SOURCE QUALITY CONTROL

Styles of "B" and "C" label fire doors utilizing standard mortise leaf hinges shall meet the following performance criteria:

- a. Split resistance: Average of ten test samples shall be not less than 500 pounds load when tested in accordance with WDMA TM-5.
- b. Cycle-slam: 200,000 cycles with no loose hinge screws or other visible signs of failure when tested in accordance with the requirements of WDMA TM-7.
- c. Hinge loading resistance: Average of ten test samples shall be not less than 700 pounds load when tested for direct screw withdrawal in accordance with WDMA TM-8 using a No. 12, 1 1/4 inch long, steel, fully threaded wood screw. Drill 5/32 inch pilot hole, use 1 1/2 inch opening around screw for bearing surface, and engage screw full, except for last 1/8 inch. Do not use a steel plate to reinforce screw area.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Before installation, seal top and bottom edges of doors with the approved water-resistant sealer. Seal cuts made on the job immediately after cutting using approved water-resistant sealer. Fit, trim, and hang doors with a 1/16 inch minimum, 1/8 inch maximum clearance at sides and top, and a 3/16 inch minimum, 1/4 inch maximum clearance over thresholds. Provide 3/8 inch minimum, 7/16 inch maximum clearance at bottom where no threshold occurs. Bevel edges of doors at the rate of 1/8 inch in 2 inches. Door warp shall not exceed 1/4 inch when measured in accordance with WDMA I.S. 1-A.

##### 3.1.1 Fire Doors

Install fire doors in accordance with NFPA 80. Do not paint over labels.

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## SECTION 08350

## MANUAL FOUR-FOLD DOORS

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (1998) Structural Welding Code - Steel

## ASTM INTERNATIONAL (ASTM)

ASTM A 36 (1992) Structural Steel

ASTM A 48 (1994ae1) Gray Iron Castings

ASTM A 500 (2001a) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

ASTM A 513 (2000) Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing

ASTM A 569 (1972) Steel Carbon (0.15 Maximum Percent) Hot-Rolled Sheet and Strip, Commercial Quality

ASTM C 920 (2002) Elastomeric Joint Sealants

ASTM E 283 (1991; R 1999) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

## THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC PS 12.01 (2002) One-Coat Zinc-Rich Painting System

SSPC SP 6 (2000) Commercial Blast Cleaning

## 1.2 ACOUSTICAL PERFORMANCE

Installed door assembly including frames, hardware and perimeter and field seals and gasketing required to meet an acoustical performance level of STC 45.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation;

submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

Doors; G-AE

Weatherseals; G-AE

Show types, sizes, locations, metal gauges including minimum metal decimal thickness hardware provisions, installation details, and other details of construction for manually operated doors.

#### SD-03 Product Data

Doors; G-AE

Submit manufacturer's product data, roughing-in diagrams, and installation instructions for each type and size of Manual Four-Fold Door.

Acoustical Performance; G-AE

Submit manufacturer factory calculations for STC requirements.

#### SD-08 Manufacturer's Instructions

Doors; G-AO

Door shall be complete unit produced by one manufacturer, including hardware, accessories, mounting and installation components.

#### SD-10 Operation and Maintenance Data

Doors; G-AO

Submit operating instructions, maintenance information, and instructions in accordance with Section 01781 OPERATIONS AND MAINTENANCE DATA.

### 1.4 DELIVERY, STORAGE, AND HANDLING

Protect doors and accessories from damage during delivery, storage, and handling. Clearly mark manufacturer's brand name. Store doors in dry locations with adequate ventilation, free from dust and water. Storage shall permit easy access for inspection and handling. Remove damaged items and provide new.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Steel Tubing, Electric Welded

ASTM A 513.

### 2.1.2 Steel Tubing, Structural Welded

ASTM A 500 Grade B.

### 2.1.3 Structural Shapes and Plates

ASTM A 36 Steel Plate Channels and Angles.

### 2.1.4 Casting, Cast Iron

ASTM A 48.

### 2.1.5 Face Sheets

ASTM A 569, Steel Sheet Metal, Hot Rolled, 14-Gauge Minimum.

### 2.1.6 Exterior Finish

Paint finish. Method of preparation is described in Part 3. See Section 09915 COLOR SCHEDULE for finish color.

## 2.2 DOORS

Doors shall be a complete unit produced by one manufacturer, including hardware, accessories, mounting and installation components.

## 2.3 DESIGN REQUIREMENTS

Design door to limit deflection to not more than  $L/120$  of their span under a minimum windload of 90 mph, exposure C. Door components shall be designed in accordance with AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings, and AISI Specification for the Design of Cold Formed Steel Structural Members.

## 2.4 FABRICATION

### 2.4.1 Door Panel Frames

Door panel frames (leaves) shall have horizontal and vertical structural framing and shall be constructed of standard steel, square steel tubing, or rectangular steel tubing section of ample size and strength for loads and stresses imposed under the specified conditions. Interior door panel frame members shall be of welded construction and all joints shall develop the full strength of the framing members. Door panel frame members shall be true and square in all directions. Door panel frames shall be sheeted on interior and exterior sides with 14 gauge flat hot rolled steel. Exterior door panel surfaces will receive mechanically attached surface mounted metal finish system. Coordinate with metal finish system manufacturer attachment and installation requirements. All exposed seams of the door panel sheeting shall be sealed with an ASTM C 920 complying sealant fabrication and prior to prime painting. Door panels shall not be bowed, warped, or out of line by more than 1/8 inch in 20 feet. Exposed welds and weld that interfere with the installation of various arts shall be ground smooth. All welding to be per AWS D1.1

#### 2.4.1.1 Insulated Sections

Door sections shall be insulated with 3-1/2 inches thick polyisocyanurate

rigid board, insulation providing an R-value of 18.9 or less. The insulating material shall be fitted to cover the entire surface of the door panel between the structural members. Fill voids with compatible spray foam in void filling insulation material.

#### 2.4.2 Hardware

Provide necessary hardware required for complete insulation. Hardware shall be heavy-duty type including all bolts, and fittings for the hardware.

##### 2.4.2.1 Door Glides

The door guides shall be steel "S" beams S4 x 7.7 minimum. Include wall support brackets. Guides shall be capable of being mounted within 10 inches headroom.

##### 2.4.2.2 Guide Roller Assemblies

The door shall have a minimum of two anti-friction guide roller assemblies.

The guide roller assemblies shall be of sufficient size to transmit the windload from the door panels to the steel door guides. Provide two (2) 3 inch diameter minimum rollers in each assembly with bearings and grease zerk fittings to take vertical load and four (4) 1 inch diameter minimum steel rollers, which take the horizontal load.

##### 2.4.2.3 Jamb Hinges

Door shall be complete with shop applied strap type jamb hinges. Jamb hinges to be constructed from 3 inches x 3/8 inch bar minimum. Jamb hinge barrel seams must be welded. Jamb hinges shall be gusseted with steel bars along both edges. Each hinge shall be supported on roller bearings. Hinges shall be through bolted on panel. Grease zerk fittings shall be provided on all hinges for greasing hinge pintles.

##### 2.4.2.4 Hinge Pintles

Jamb hinges shall have continuous 7/8 inch diameter steel pintles the full height of the opening. Fold hinges shall have minimum 7/8 inches diameter steel pintles the height of the hinge assembly.

##### 2.4.2.5 Fold Hinges

Door shall be complete with mortised hinges. Mortised fold hinges to be constructed from 3/8 inch steel plate or bar. Fold hinge barrel seam must be welded. Fold hinges shall be of dual capture design and have no less than two (2) shear planes. Fold hinges shall be equipped with a 7/8 inch diameter hinge pin with grease chase and grease zerk for lubrication. All fold hinges shall be equipped with two (2) roller bearings,

##### 2.4.2.6 Cane Bolts

Provide heavy-duty type floor level cane bolts to hold the door in the closed position. Provide one(1) cane bolt for each door leaf.

##### 2.4.2.7 Chain Pulls

Provide heavy-duty type chain pull bolts at top of door panels to hold the door in the closed position. Provide one (1) chain pull per door leaf.

## 2.5 WEATHERSEALS

Provide impregnated dual durometer bulb type weather-seal at the jambs, sill and head, cloth inserted rubber sweep at sill, combination reversing edge and rubber seal at meeting edges, and sponge and metal astragal between door sections. Manufacturer shall provide test reports of a factory test similar door system for air leakage per ASTM E 283 Test with test results verified by an independent testing laboratory.

## 2.6 FINISHES

Thoroughly clean, pre-treat and prime surfaces of door assembly including fixed panels, trims, support and closure pieces.

### 2.6.1 Pre-Treatment

Pre-treat with primer as required by manufacturer. Surface preparation on carbon steel surfaces shall be SSPC SP 6 commercial sand blast.

### 2.6.2 Primer

Where required, steel surfaces shall be shop painted with one coat of zinc rich primer conforming to SSPC PS 12.01. Surface preparation on carbon steel surfaces shall be SSPC SP 6 commercial sand blast.

### 2.6.3 Painting

Finish painting by others is specified in Section 09900 PAINTS AND COATINGS for systems and color selection in Section 09915 COLOR SCHEDULE.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Install doors in accordance with approved shop drawings and manufacturers instructions. Upon completion, doors shall be weathertight and free from warp, twist, or distortion. Lubricate and adjust doors to operate freely. The installation of the doors shall be by a factory trained and certified installer of the door manufacturer or supervised by an authorized representative of the door manufacturer.

### 3.2 OPERATION AND MAINTENANCE

After installation is complete, provide narrated videotape providing detailed information for maintenance and adjustments. Install gate and operating equipment with necessary hardware, and equipment in accordance with final Shop Drawings, Manufacturer's instructions, and as specified herein. Instruct and observe Owner's maintenance staff representative through a minimum of two complete cycles of opening and closing doors using all the functions of operating hardware.

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## SECTION 08385

## STEEL ACOUSTICAL DOOR ASSEMBLIES

## PART 1 GENERAL

## 1.1 GENERAL REQUIREMENTS

## 1.1.1 Design Requirements

Acoustical door assemblies to include doors, frames, and door hardware to include gasketing systems, retainers and retainer covers, adjustable door bottoms, cam-lift hinges, thresholds, and sills, required to achieve specified performance requirements.

## 1.1.2 Performance Requirements

Sound Transmission Coefficient rating of STC 53 for installed assembly, when tested as operable door assembly in accordance with ASTM E 90 and ASTM E 413. Field tests performed in accordance with ASTM E 336 and ASTM E 413 substantiating acoustic performance at no less than four FSTC ratings below the specified STC rating.

## 1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM A 366	(1972) Steel, Carbon, Cold-Rolled Sheet, Commercial Quality
ASTM A 569	(1972) Steel Carbon (0.15 Maximum Percent) Hot-Rolled Sheet and Strip, Commercial Quality
ASTM A 653/A 653M	(2002a) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B 117	(1997) Operating Salt Spray (Fog) Apparatus
ASTM D 1735	(2002) Testing Water Resistance of Coatings Using Water Fog Apparatus
ASTM E 336	(1997) Measurement of Airborne Sound Insulation in Buildings
ASTM E 413	(1987; R 1999) Rating Sound Insulation
ASTM E 90	(2002) Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM HMMA 80                      Installation and Storage of Hollow Metal  
Doors and Frames; Hollow Metal  
Manufacturers Association.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80                              (1999) Fire Doors and Fire Windows

1.3 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-02 Shop Drawings

Doors; G-AE

Frames; G-AE

Door Hardware; G-AE

Show elevations, construction details, metal gages, hardware provisions, and installation printed instructions and details.

Schedule of doors; G-AE

Schedule of frames; G-AE

Submit door and frame locations.

SD-03 Product Data

Doors; G-AE

Frames; G-AE

Door Hardware; G-AE

Submit manufacturer's descriptive literature for doors, frames, and hardware. Include data and details on door construction, panel (internal) reinforcement, insulation, and door edge construction.

SD-04 Samples

Wood Veneers; G-AE

Submit a minimum of three veneer samples.

SD-06 Test Reports

Performance Requirements

Certified laboratory reports, performed in accordance with ASTM E

90 and ASTM E 413, from independent testing laboratory qualified under the National Voluntary Laboratory Accreditation Program (NVLAP) supporting compliance of assemblies to specified requirements.

Minimum five (5) field tests, performed in accordance with ASTM E 336 and ASTM E 413 by five separate independent testing agencies, substantiating acoustical performance with installed at no less than four (4) FSTC ratings below the specified STC rating.

#### SD-07 Certificates

Doors  
Frames

Contractor's certification that products of this section, as provided, meet or exceed specified requirements. Manufacturer of products of this section meet specified qualifications. Warranty documents, executed by manufacturer in Owner's name. Certified statement of manufacturer's authorized representative, as specified in FIELD QUALITY CONTROL Article of PART 3 of this section. Certified test reports of independent testing agency, as specified in FIELD QUALITY CONTROL Article of PART 3 of this section.

#### SD-10 Operation and Maintenance Data

Doors; G-AO  
Frames; G-AO  
Door Hardware; G-AO

Operation and maintenance data for assembly components.

### 1.4 QUALITY ASSURANCE

#### 1.4.1 Manufacturer's Qualifications

Minimum five years documented experience producing systems specified in this section.

#### 1.4.2 Installer Qualifications

Minimum five years documented experience installing systems specified in this section, and approved by manufacturer.

### 1.5 DELIVERY, STORAGE, AND HANDLING

Deliver doors, frames, and accessories undamaged and with protective wrappings or packaging. Store frames and steel door in accordance with requirements of NAAMM HMMA 80. Store doors and frames on platforms under cover in clean, dry, ventilated, and accessible locations, with 1/4 inch airspace between doors. Remove damp or wet packaging immediately and wipe affected surfaces dry. Replace damaged materials with new.

### 1.6 SCHEDULING

Furnish manufacturer's mounting templates for door hardware specified in Section 08710 to manufacturer of products of this section in time for

factory preparation for door hardware.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Steel Sheet

Steel sheet shall be either cold-rolled steel sheet conforming to ASTM A 366, commercial quality or hot-rolled sheet conforming to ASTM A 569, pickled and oiled, commercial quality.

#### 2.1.2 Galvanized Steel Sheet

Galvanized steel sheet shall be ASTM A 653/A 653M, commercial quality, minimum G60 zinc coating.

#### 2.1.3 Acoustical Material

Acoustical material shall be manufacturer's standard for required STC rating.

#### 2.1.4 Primer

Primer shall meet ASTM B 117 salt spray for 150 hours, and ASTM D 1735 water fog test for organic coatings for 200 hours.

### 2.2 STEEL DOORS

Prepare doors to receive hardware specified in Section 08710, "Door Hardware." Exterior doors shall have top edge closed flush and sealed to prevent water intrusion. Doors shall be 1 3/4 inches thick, unless otherwise indicated. Doors shall be of sound classification scheduled.

#### 2.2.1 Face Sheets

For doors for interior use provide steel sheet, minimum 16 gage sheet thickness. For doors for exterior use provide galvanized steel sheet, minimum 16 gage sheet thickness. Visible seams on face sheets are not permitted.

#### 2.2.2 Core

Stiffen face sheets with continuous vertical steel sections. Fill spaces between stiffeners with acoustical material.

#### 2.2.3 Vertical Edges

Join face sheets at vertical edges by continuous welding. Join door faces by continuous weld on each edge, extending full door height. Grind, fill, and dress welds to provide smooth flush surface. Form edge profiles both vertical edges of doors with 1/8 inch in 2 inches bevel. Visible seams on vertical edges not permitted.

#### 2.2.4 Horizontal Edges

Close top and bottom edges of doors with continuous steel channels, 16 gage minimum; spot-weld channels to both door faces. Provide openings in bottom closure of exterior doors to permit escape of entrapped moisture. Provide

additional flush closing channel at top edge of doors; spot-weld channel to both door faces.

#### 2.2.5 Hardware Preparation

Mortise, reinforce, drill, and tap doors at factory for fully templated mortised hardware only, in accordance with approved hardware schedule and supplied templates. Provide protective reinforcing zee brackets at surface-mounted or non-templated hardware locations.

#### 2.2.6 Wood Veneers

Provide faces of premium grade oak where indicate don drawings. Hardwood veneers shall be plain sliced book matched. Match appearance and finish of wood doors specified in Section 08210 WOOD DOORS.

### 2.3 FRAMES

Fabricate in accordance with Architect-approved shop drawings, and as follows.

#### 2.3.1 Frames for Interior Use

Fabricate from steel sheet, minimum 14-gage thickness.

#### 2.3.2 Frames for Exterior Use

Fabricate from galvanized steel sheet, minimum 14-gage thickness.

#### 2.3.3 Form

Form frame members straight, and of uniform profile through lengths, as welded units with integral trim, of sizes and profiles indicated. Weld contact edges of joints closed tight. Miter perimeter trim faces and weld continuously.

#### 2.3.4 Shipping

When shipping limitations so dictate, fabricate frames for large openings in sections designed for assembly in the field; install alignment plates or angles, of same material and gage as frame, at each joint.

#### 2.3.5 Hardware Preparation

Mortise, reinforce, drill, and tap frames at factory for fully templated mortised hardware only, in accordance with Architect-approved shop drawings and supplied templates. Provide protective reinforcing zee brackets at surface-mounted or non-templated hardware locations.

#### 2.3.6 Floor Anchors

Fabricate of same material as frame material; minimum 14 gage. Weld anchors inside each jamb for floor anchorage.

#### 2.3.7 Jamb Anchors

Fabricate of same material as frame material; weld anchors inside each jamb for wall anchorage. Provide anchor types for indicated adjacent wall construction. For frames installed in masonry walls, provide adjustable

jamb anchors, 16 gage, T-shape type. For frames installed in stud partitions, provide continuous 16 gage steel channel to surround stud, welded inside each jamb.

#### 2.3.8 Plaster Guards

Fabricate from minimum 22 gage steel; weld in place at hardware mortises on frames to be set in masonry openings.

#### 2.3.9 Bracing During Shipping

Provide welded frames with temporary steel spreader welded to jamb feet for bracing during shipping and handling.

### 2.4 FIRE DOORS AND FRAMES

NFPA 80 and this specification. The requirements of NFPA 80 shall take precedence over details indicated or specified.

### 2.5 DOOR HARDWARE

Supply gasketing systems, retainers, retainer covers, automatic door bottoms, fixed door bottoms, cam-lift hinges, thresholds, and sills as indicated on Architect-approved shop drawings, or specified in manufacturer's product data for project conditions, to achieve specified performance requirements. All other door hardware is specified in Section 08710.

### 2.6 SILL CONDITION

Where indicated furnish a smooth flush stainless steel or aluminum threshold for the door bottom to seal against when the door is in the closed position. The minimum width of the threshold shall be door thickness plus 4" to allow the threshold to extend a minimum of 1-1/2" beyond the face of the door on both sides of the opening. For openings where carpet extends through the opening, the threshold height shall be 1/8" greater in height than the carpet thickness.

### 2.7 FINISH

All tool marks and surface imperfections shall be removed and exposed faces of all welded joints shall be dressed smooth. Assemblies shall be treated and shall be coated on all accessible surfaces with a rust-inhibitive primer which meets ASTM B117 salt spray for 150 hours, and ASTM D 1735 water fog test for organic coatings for 200 hours, and which is fully cured prior to shipment.

### 2.8 SOURCE QUALITY CONTROL

Hardware location on doors and frames as follows.

1. Hinges:
  - Top: 5 inches from head of frame to top of hinge.
  - Bottom: 10 inches from finished floor to bottom of hinge.
2. Unit and integral type locks and latches: 38 inches from finished floor to centerline of knob.
3. Deadlocks: 48 inches from finished floor to centerline of strike.
4. Panic hardware: 38 inches from finished floor to centerline of cross bar, or as indicated on hardware template.



## PART 3 EXECUTION

### 3.1 INSTALLATION

#### 3.1.1 Verification of Conditions

Prior to installation, check and correct frames for size, swing, squareness, alignment, twist and plumb. Verify openings are in accordance with approved shop drawings.

#### 3.1.2 Installer's Examination

Have installer of this section examine conditions under which construction activities of this section are to be performed, then submit written notification if such conditions are unacceptable. Transmit two copies of installer's report to Architect within 24 hours of receipt. Beginning construction activities of this section before unacceptable conditions have been corrected is prohibited. Beginning construction activities of this section indicates installer's acceptance of conditions.

### 3.2 PREPARATION

Remove steel spreaders from welded frames prior to installation; use of spreaders for installation purposes not permitted.

### 3.3 INSTALLATION

#### 3.3.1 General

Install units in accordance with approved shop drawings and manufacturer's printed installation instructions; in addition, install steel components in accordance with NAAMM HMMA 80. Fill voids between concealed side of frame and adjacent wall construction with lightweight gypsum plaster in accordance with approved shop drawings or manufacturer's printed installation instructions. Finish surfaces having abrasion damage smooth; touch-up with rust inhibitive primer. Install gasketing systems, retainers, retainer covers, automatic door bottoms, fixed door bottoms, cam-lift hinges, thresholds, and sills in accordance with manufacturer's printed instructions. Installation of all other door hardware is specified in Section 08710.

#### 3.3.2 Site Tolerances

Do not exceed the following installation tolerances: Squareness shall be plus or minus 1/16 inch measured on a line, 90 degrees from one jamb, at the upper corner of the frame at the other jamb. Alignment shall be plus or minus 1/16 inch measured on jambs on a horizontal line parallel to the plane of the wall. Twist shall be plus or minus 1/16 inch measured at face corners of jambs on parallel lines perpendicular to the plane of the wall. Plumb shall be plus or minus 1/16 inch measured on the jamb at the floor.

#### 3.3.3 Fire Doors and Frames

Install fire doors and frames, including hardware, in accordance with NFPA 80.

### 3.4 FIELD QUALITY CONTROL

Manufacturer's authorized representative services:

1. Inspect completed installation of door and frame assemblies.
2. Test all components through a minimum of ten complete cycles of operation.
3. Verify each component is correctly installed.
4. Direct installer in adjusting components for correct operation.
5. Issue certified statement of compliance of installed door and frame assemblies to Architect-approved shop drawings.
6. Instruct Owner's maintenance personnel in correct operation and maintenance procedures for components of door and frame assemblies.

Notify Architect a minimum of four (4) calendar days prior to scheduled testing dates.

### 3.5 PROTECTION

Protect doors and frames from damage. Repair damaged doors and frames prior to completion and acceptance of the project or replace with new, as directed. Wire brush rusted frames until rust is removed. Clean thoroughly. Apply an all-over coat of rust-inhibitive paint of the same type used for shop coat.

### 3.6 CLEANING

Upon completion, clean exposed surfaces of doors and frames thoroughly. Remove mastic smears and other unsightly marks.

-- End of Section --

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SECTION 08710

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## SECTION 08710

DOOR HARDWARE  
02/02

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM E 283 (1991; R 1999) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

ASTM F 883 (1997) Padlocks

## BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

BHMA A156.1 (1997) Butts and Hinges (BHMA 101)

BHMA A156.2 (1996) Bored and Preassembled Locks and Latches (BHMA 601)

BHMA A156.3 (1994) Exit Devices (BHMA 701)

BHMA A156.4 (1992) Door Controls - Closers (BHMA 301)

BHMA A156.5 (1992) Auxiliary Locks & Associated Products (BHMA 501)

BHMA A156.6 (1994) Architectural Door Trim (BHMA 1001)

BHMA A156.7 (1988) Template Hinge Dimensions

BHMA A156.8 (1994) Door Controls - Overhead Holders (BHMA 311)

BHMA A156.13 (1994) Mortise Locks & Latches (BHMA 621)

BHMA A156.16 (1997) Auxiliary Hardware

BHMA A156.18 (1993) Materials and Finishes (BHMA 1301)

BHMA A156.21 (1996) Thresholds

BHMA A156.22 (1996) Door Gasketing Systems

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80 (1999) Fire Doors and Fire Windows

NFPA 101 (2003) Code for Safety to Life from Fire  
in Buildings and Structures

STEEL DOOR INSTITUTE (SDI)

SDI 100 (1991) Standard Steel Doors and Frames

UNDERWRITERS LABORATORIES (UL)

UL Bld Mat Dir (2003) Building Materials Directory

## 1.2 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

### SD-02 Shop Drawings

Hardware schedule; G-AE

Keying system; G-AO

Keying Meeting; G-AO

### SD-03 Product Data

Hardware items; G-AE

### SD-08 Manufacturer's Instructions

Installation

### SD-10 Operation and Maintenance Data

Hardware Schedule items, Data Package 1; G-AE

Submit data package in accordance with Section 01781, "Operation and Maintenance Data."

### SD-11 Closeout Submittals

Key bitting; G-AO

## 1.3 HARDWARE SCHEDULE

Prepare and submit hardware schedule in the following form:

Hard- ware Item	Quan- tity	Size	Reference Publi- cation Type No.	Finish	Mfr. Name and Catalog No.	Key Con- trol Symbols	UL Mark (If fire rated and listed)	BHMA Finish Designa- tion
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## 1.4 KEYING MEETING

For keying of locks convene 2 keying meetings with government

representative and users. Submit lock log for all doors including schedule.

#### 1.5 KEY BITTING CHART REQUIREMENTS

Submit key bitting charts to the Contracting Officer prior to completion of the work. Include:

- a. Complete listing of all keys (AA1, AA2, etc.).
- b. Complete listing of all key cuts (AA1-123456, AA2-123458).
- c. Tabulation showing which key fits which door.
- d. Copy of floor plan showing doors and door numbers.
- e. Listing of 20 percent more key cuts than are presently required in each master system.

#### 1.6 QUALITY ASSURANCE

##### 1.5.1 Hardware Manufacturers and Modifications

Provide, as far as feasible, locks, hinges, and closers of one lock, hinge, or closer manufacturer's make. Modify hardware as necessary to provide features indicated or specified.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

Deliver hardware in original individual containers, complete with necessary appurtenances including fasteners and instructions. Mark each individual container with item number as shown in hardware schedule. Deliver permanent keys and removable cores to the 28 CES Structures Shop either directly or by certified mail from Best. Deliver construction master keys with the locks.

### PART 2 PRODUCTS

#### 2.1 TEMPLATE HARDWARE

Hardware to be applied to metal or to prefabricated doors shall be made to template. Promptly furnish template information or templates to door and frame manufacturers. Template hinges shall conform to BHMA A156.7. Coordinate hardware items to prevent interference with other hardware.

#### 2.2 HARDWARE FOR FIRE DOORS AND EXIT DOORS

Provide all hardware necessary to meet the requirements of NFPA 80 for fire doors and NFPA 101 for exit doors, as well as to other requirements specified, even if such hardware is not specifically mentioned under paragraph entitled "Hardware Schedule." Such hardware shall bear the label of Underwriters Laboratories, Inc., and be listed in UL Bld Mat Dir or labeled and listed by another testing laboratory acceptable to the Contracting Officer.

#### 2.3 HARDWARE ITEMS

Hinges, locks, latches, exit devices, bolts, and closers shall be clearly and permanently marked with the manufacturer's name or trademark where it

will be visible after the item is installed. For closers with covers, the name or trademark may be beneath the cover.

### 2.3.1 Hinges

Unless noted otherwise, comply with the following: use full-mortise (butt) hinges except where special types are required. Use swing-clear hinges where necessary to keep door opening completely clear when door is opened 90 to 95 degrees. Use wide-throw hinges where necessary to keep door leaf clear of wall, casings, jambs, or reveals. Use antifriction-bearing hinges on high-frequency or extra-heavy doors, and on doors equipped with closers. Use Grade 1 full mortise type 4-ball bearing hinges on low-frequency doors up to 3 feet wide and without closers. Hinges on natural wood doors shall be steel with BHMA 652 finish (satin chromium plated) or BHMA 639 finish (satin bronze plated) to match finish of other door hardware. Hinges for exterior doors shall be stainless steel with BHMA 630 finish or solid brass or bronze with BHMA 626 finish. Use two hinges for doors 60 inches or less in height and one additional hinge for each additional 30 inches (or fraction thereof) of door height.

Hinge Sizes Chart

Thickness of Doors in Inches	Width of Doors in Inches	Height of Hinge (Length of Joint) in Inches
1 3/4	To 36	4 1/2
1 3/4	Over 36 to 48	5 Heavy Weight
1 3/4	Over 48	6 Heavy Weight

1. Select and size hinges for unusually heavy, and high-frequency doors on an individual basis.

2. The 4 1/2 by 4 1/2 inches listed is for 1 3/4 inch doors up to 3 feet wide and with up to 3/4 inch trim projection, and covers the majority of openings. For other doors, determine hinge width in accordance with:

Twice the door thickness plus trim projection, minus 1/2 inch, or  $2(t+p)-1/2$ . If answer falls between regular hinge sizes, use nearest larger size. Formula is for hinges set back 1/4 inch from edge of door.

BHMA A156.1, 4 1/2 by 4 1/2 inches unless otherwise specified. Construct loose pin hinges for exterior doors and reverse-bevel interior doors so that pins will be nonremovable when door is closed. Other antifriction bearing hinges may be provided in lieu of ball-bearing hinges.

### 2.3.2 Locks and Latches

#### 2.3.2.1 Mortise Locks and Latches

BHMA A156.13, Series 1000, Operational Grade 1, Security Grade 2. Levers and roses of mortise locks shall have screwless shanks and no exposed screws.

#### 2.3.2.2 Combination Locks

Heavy-duty, mechanical combination lockset with six or nine pushbuttons, standard-sized knobs, 3/4 inch deadlocking latch, 2 3/4 inch backset.



Lock shall be operated by pressing two or more of the buttons in unison or individually in the proper sequence. Inside knob shall always operate the latch. Provide a keyed cylinder on the interior to permit setting the combination. Provide a keyed removable-core cylinder on the exterior to permit bypassing the combination.

#### 2.3.3 Exit Devices

BHMA A156.3, Grade 1. Provide adjustable strikes for rim type and vertical rod devices. Provide open back strikes for pairs of doors with mortise and vertical rod devices. Touch bars shall be provided in lieu of conventional crossbars and arms. Provide escutcheons, not less than 7 by 2 1/4 inches.

#### 2.3.4 Cylinders and Cores

Provide cylinders and cores for new locks, including locks provided under other sections of this specification. Cylinders and cores shall have seven pin tumblers. Cylinders shall be products of one manufacturer, and cores shall be the products of one manufacturer. Rim cylinders, and mortise cylinders shall have interchangeable cores which are removable by special control keys. Stamp each interchangeable core with a key control symbol in a concealed place on the core.

Provide cylinders for new locks, including locks provided under other sections of this specification. Cylinders shall be fully compatible with products of the Best Lock Corporation and shall have interchangeable cores which are removable by a special control key. The cores shall have seven pin tumblers and shall be factory set using Best Premium, 7 Pin. Submit a core code sheet with the cores. The cores shall be master keyed in one system for this project. Provide construction interchangeable cores.

#### 2.3.5 Keying System

Provide a grand master keying system. Provide a construction master keying system and construction interchangeable cores. Provide two key cabinets as specified.

Sub-master keying system shall be provided for the building, and shall be keyed to the existing Best removable-core master and grand master keying systems. Equipment spaces, mechanical rooms, and communication equipment rooms shall be keyed separately from the building systems, and shall be keyed alike to the existing Best master and grand master systems for these doors.

#### 2.3.6 Lock Trim

Cast, forged, or heavy wrought construction and commercial plain design.

##### 2.3.6.1 Roses

In addition to meeting test requirements of BHMA A156.2 and BHMA A156.13, roses and escutcheons shall be 0.050 inch thick if unreinforced. If reinforced, outer shell shall be 0.035 inch thick and combined thickness shall be 0.070 inch, except knob shanks shall be 0.060 inch thick.

##### 2.3.6.2 Lever Handles

Provide lever handles. Lever handles for exit devices shall meet the test requirements of BHMA A156.13 for mortise locks. Lever handle locks shall

have a breakaway feature (such as a weakened spindle or a shear key) to prevent irreparable damage to the lock when a force in excess of that specified in BHMA A156.13 is applied to the lever handle. Lever handles shall return to within 1/2 inch of the door face.

#### 2.3.7 Keys

Furnish one file key, one duplicate key, and one working key for each key change and for each master and grand master keying system. Furnish one additional working key for each lock of each keyed-alike group. Furnish 8 blank great grand master keys. Furnish a quantity of 2 key blanks for each core. Stamp each key with appropriate key control symbol and "U.S. property - Do not duplicate." Do not place room number on keys.

#### 2.3.8 Door Bolts

BHMA A156.16. Provide dustproof strikes for bottom bolts, except for doors having metal thresholds. Automatic latching flush bolts: BHMA A156.3, Type 25.

#### 2.3.9 Closers

BHMA A156.4, Series C02000, Grade 1, with PT 4D. At accessible entrances provide closers with PT 4F and PT 4H. Provide with brackets, arms, mounting devices, fasteners, full size covers, except at storefront mounting, and other features necessary for the particular application. Size closers in accordance with manufacturer's recommendations, or provide multi-size closers, Sizes 1 through 6, and list sizes in the Hardware Schedule. Provide manufacturer's 10 year warranty. In so far as practicle, or unless otherwise shown, doors opening to or from halls and corridors shall have the closer mounted on the room side of the door.

#### 2.3.10 Overhead Holders

Use overhead holders for doors which will not swing 180 degrees and where there is no adjacent wall to accommodate wall type holder and stop.

BHMA A156.8.

#### 2.3.11 Door Protection Plates

BHMA A156.6.

##### 2.3.11.1 Sizes of Kick Plates

Width for single doors shall be 2 inches less than door width; width for pairs of doors shall be one inch less than door width. Height of kick plates shall be 10 inches for flush doors.

#### 2.3.12 Door Stops and Silencers

BHMA A156.16. Silencers Type L03011. Provide three silencers for each single door, two for each pair.

#### 2.3.13 Padlocks

ASTM F 883.

#### 2.3.14 Thresholds

BHMA A156.21. Use J35100, with vinyl or silicone rubber insert in face of stop, for exterior doors opening out, unless specified otherwise.

#### 2.3.15 Weather Stripping Gasketing

BHMA A156.22. Provide the type and function designation where specified in paragraph entitled "Hardware Schedule". A set shall include head and jamb seals, sweep strips, and, for pairs of doors, astragals. Air leakage of weather stripped doors shall not exceed 1.25 cubic feet per minute of air per square foot of door area when tested in accordance with ASTM E 283. Weather stripping shall be one of the following:

##### 2.3.15.1 Extruded Aluminum Retainers

Extruded aluminum retainers not less than 0.050 inch wall thickness with vinyl, neoprene, silicone rubber, or polyurethane inserts. Aluminum shall be clear (natural) anodized.

#### 2.3.16 Special Tools

Provide special tools, such as spanner and socket wrenches and dogging keys, required to service and adjust hardware items.

#### 2.4 FASTENERS

Provide fasteners of proper type, quality, size, quantity, and finish with hardware. Fasteners exposed to weather shall be of nonferrous metal or stainless steel. Provide fasteners of type necessary to accomplish a permanent installation.

#### 2.5 FINISHES

BHMA A156.18. Hardware shall have BHMA 630 finish (satin stainless steel), unless specified otherwise. Provide items not manufactured in stainless steel in BHMA 626 finish (satin chromium plated) over brass or bronze, except surface door closers which shall have aluminum paint finish, and except steel hinges which shall have BHMA 652 finish (satin chromium plated). Hinges for exterior doors shall be stainless steel with BHMA 630 finish or chromium plated brass or bronze with BHMA 626 finish. Exit devices may be provided in BHMA 626 finish in lieu of BHMA 630 finish except where BHMA 630 is specified under paragraph entitled "Hardware Sets". Exposed parts of concealed closers shall have finish to match lock and door trim. Hardware for aluminum doors shall be finished to match the doors.

#### 2.6 KEY CABINET AND CONTROL SYSTEM

BHMA A156.5Type required to yield a capacity (number of hooks) to store a minimum of 2 keys for each room on an individual key hook.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Install hardware in accordance with manufacturers' printed instructions. Fasten hardware to wood surfaces with full-threaded wood screws or sheet metal screws. Provide machine screws set in expansion shields for

fastening hardware to solid concrete and masonry surfaces. Provide toggle bolts where required for fastening to hollow core construction. Provide through bolts where necessary for satisfactory installation.

### 3.1.1 Weather Stripping Installation

Handle and install weather stripping so as to prevent damage. Provide full contact, weather-tight seals. Doors shall operate without binding.

#### 3.1.1.1 Stop-Applied Weather Stripping

Fasten in place with color-matched sheet metal screws not more than 9 inches o.c. after doors and frames have been finish painted.

### 3.1.2 Threshold Installation

Extend thresholds the full width of the opening and notch end for jamb stops. Set thresholds in a full bed of sealant and anchor to floor with cadmium-plated, countersunk, steel screws in expansion sleeves.

## 3.2 FIRE DOORS AND EXIT DOORS

Install hardware in accordance with NFPA 80 for fire doors, NFPA 101 for exit doors.

## 3.3 HARDWARE LOCATIONS

SDI 100, unless indicated or specified otherwise.

- a. Kick Plates: Push side of single-acting doors. Both sides of double-acting doors.

## 3.4 KEY CABINET AND CONTROL SYSTEM

Locate where indicated. Tag one set of file keys and one set of duplicate keys. Place other keys in appropriately marked envelopes, or tag each key.

Furnish complete instructions for setup and use of key control system. On tags and envelopes, indicate door and room numbers or master or grand master key.

## 3.5 FIELD QUALITY CONTROL

After installation, protect hardware from paint, stains, blemishes, and other damage until acceptance of work. Submit notice of testing 15 days before scheduled, so that testing can be witnessed by the Contracting Officer. Adjust hinges, locks, latches, bolts, holders, closers, and other items to operate properly. Demonstrate that permanent keys operate respective locks, and give keys to the Contracting Officer. Correct, repair, and finish, as directed, errors in cutting and fitting and damage to adjoining work.

## 3.6 HARDWARE SETS

Hardware for aluminum doors shall be provided under this section. Deliver Hardware templates and hardware, except field-applied hardware to the aluminum door and frame manufacturer for use in fabricating the doors and frames.

HW SET: 010

3	EA	HINGES	A8112 4.5 x 4.5	652
1	EA	PASSAGE SET	F01	626
1	EA	STOP	L52101 OR L52251	630

FUNCTION: LATCHBOLT RETRACTED BY LEVER EITHER SIDE

HW SET: 011

3	EA	HINGES	A8112 4.5 x 4.5	652
1	EA	PRIVACY	F22	626
1	EA	OVERHEAD STOP	C02541	630

FUNCTION: LATCHBOLT BY LEVER EITHER SIDE UNLESS PUSH BUTTON OR TURN LEVER INSIDE LOCKS OUTSIDE LEVER. PUSH BUTTON RELEASED BY TURNING INSIDE LEVER OR BY CLOSING DOOR. EMERGENCY RELEASE ON OUTSIDE UNLOCKS OUTSIDE LEVER

HW SET: 013

3	EA	HINGES	A8112 4.5 x 4.5 NRP	652
1	EA	CLASSROOM LOCKSET	F05	626
1	EA	IC CYLINDER	AS REQUIRED	626 BES
1	EA	STOP	L52101 OR L52251	630

FUNCTION: LATCHBOLT RETRACTED BY LEVER EITHER SIDE UNLESS OUTSIDE LEVER IS LOCKED BY KEY. KEY OUTSIDE LOCKS OR UNLOCKS OUTSIDE LEVER. DEADLOCKING LATCHBOLT.

HW SET: 030A

3	EA	HINGES	A8112 4.5 x 4.5	652
1	EA	PASSAGE SET	F01	626
1	EA	CLOSER	C02011 OR C02021	689
1	EA	STOP	L52101 OR L52251	630
1	EA	SMOKE GASKET	ROU154	BRN

FUNCTION: LATCHBOLT RETRACTED BY LEVER EITHER SIDE

HW SET: 031

3	EA	HINGES	A8112 4.5 x 4.5	652
1	EA	PRIVACY	F22	626
1	EA	CLOSER	TYPE C02021 W/STOP ARM	689
1	EA	KICK PLATE	12" X 2" LDW .050 B4E	630

FUNCTION: LATCHBOLT BY LEVER EITHER SIDE UNLESS PUSH BUTTON OR TURN LEVER INSIDE LOCKS OUTSIDE LEVER. PUSH BUTTON RELEASED BY TURNING INSIDE LEVER OR BY CLOSING DOOR. EMERGENCY RELEASE ON OUTSIDE UNLOCKS OUTSIDE LEVER.

HW SET: 033

3	EA	HINGES	A8112 4.5 x 4.5 NRP	652
1	EA	CLASSROOM LOCKSET	F05	626
1	EA	IC CYLINDER	AS REQUIRED	626 BES
1	EA	CLOSER	C02011 OR C02021	689
1	EA	KICK PLATE	12" X 2" LDW .050 B4E	630
1	EA	STOP	L52101 OR L52251	630

FUNCTION: LATCHBOLT RETRACTED BY LEVER EITHER SIDE UNLESS OUTSIDE LEVER IS LOCKED BY KEY. KEY OUTSIDE LOCKS OR UNLOCKS OUTSIDE LEVER. DEADLOCKING

## LATCHBOLT.

## HW SET: 033A

3	EA	HINGES	A8112 4.5 x 4.5 NRP	652	
1	EA	CLASSROOM LOCKSET	F05	626	
1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	CLOSER	C02011 OR C02021	689	
1	EA	KICK PLATE	12" X 2" LDW .050 B4E	630	
1	EA	STOP	L52101 OR L52251	630	
1	EA	SMOKE GASKET	R0U154	BRN	

FUNCTION: LATCHBOLT RETRACTED BY LEVER EITHER SIDE UNLESS OUTSIDE LEVER IS LOCKED BY KEY. KEY OUTSIDE LOCKS OR UNLOCKS OUTSIDE LEVER. DEADLOCKING LATCHBOLT.

## HW SET: 033B

3	EA	HINGES	BY DOOR SUPPLIER	630	
1	EA	CLASSROOM LOCKSET	F05	626	
1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	CLOSER	C02011 OR C02021	689	
1	EA	KICK PLATE	12" X 2" LDW .050 B4E	630	
1	EA	STOP	L52101 OR L52251	630	
1	EA	SOUND SEALS	BY DOOR SUPPLIER		
1	EA	AUTO DR BOTTOM	BY DOOR SUPPLIER		
1	EA	THRESHOLD	BY DOOR SUPPLIER		

FUNCTION: LATCHBOLT RETRACTED BY LEVER EITHER SIDE UNLESS OUTSIDE LEVER IS LOCKED BY KEY. KEY OUTSIDE LOCKS OR UNLOCKS OUTSIDE LEVER. DEADLOCKING LATCHBOLT.

## HW SET: 034

3	EA	HINGES	A8112 4.5 x 4.5 NRP	652	
1	EA	STOREROOM LOCKSET	F07	626	
1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	CLOSER	TYPE C02021 W/STOP ARM	689	
1	EA	KICK PLATE	12" X 2" LDW .050 B4E	630	

FUNCTION: LATCHBOLT RETRACTED BY LEVER INSIDE ONLY. OUTSIDE LEVER IS ALWAYS RIGID. KEY OUTSIDE RETRACTS LATCHBOLT. DEADLOCKING LATCHBOLT.

## HW SET: 034A

3	EA	HINGES	A8112 4.5 x 4.5 NRP	652	
1	EA	STOREROOM LOCKSET	F07	626	
1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	CLOSER	C02011 OR C02021	689	
1	EA	KICK PLATE	12" X 2" LDW .050 B4E	630	
1	EA	STOP	L52101 OR L52251	630	
1	EA	SMOKE GASKET	R0U154	BRN	

FUNCTION: LATCHBOLT RETRACTED BY LEVER INSIDE ONLY. OUTSIDE LEVER IS ALWAYS RIGID. KEY OUTSIDE RETRACTS LATCHBOLT. DEADLOCKING LATCHBOLT.

## HW SET: 034C

3	EA	HINGES	BY DOOR SUPPLIER		
1	EA	STOREROOM LOCKSET	F07	626	
1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	CLOSER	TYPE C02021 W/STOP ARM	689	
1	EA	KICK PLATE	12" X 2" LDW .050 B4E	630	
1	EA	STOP	L52101 OR L52251	630	
1	EA	SOUND SEAL	BY DOOR SUPPLIER		
1	EA	AUTO DR BOTTOM	BY DOOR SUPPLIER		
1	EA	THRESHOLD	BY DOOR SUPPLIER		

FUNCTION: LATCHBOLT RETRACTED BY LEVER INSIDE ONLY. OUTSIDE LEVER IS ALWAYS RIGID. KEY OUTSIDE RETRACTS LATCHBOLT. DEADLOCKING LATCHBOLT.

HW SET: 034E

3	EA	HINGES	A8112 4.5 x 4.5 NRP	652	
1	EA	POWER TRANSFER	EPT-2	689	VON
1	EA	ELECTRIC MORT LOCK	SERIES 1000 GRADE 1		
			FAIL SECURE	626	
1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	CLOSER	C02011 OR C02021	689	
1	EA	KICK PLATE	12" X 2" LDW .050 B4E	630	
1	EA	STOP	L52101 OR L52251	630	
1	EA	POWER SUPPLY	510 X EIR X DCM1	GRY	LOC
1	EA	WIRE DIAGRAM	BY HARDWARE SUPPLIER		XXX
1	EA	CARD READER	BY OTHERS		XXX

FUNCTION: LATCHBOLT RETRACTED BY LEVER INSIDE OR BY OUTSIDE LEVER FOLLOWING THE PRESENTATION OF A VALID CREDENTIAL. DEADLOCKING LATCHBOLT.

HW SET: 034J

3	EA	HINGES	A8112 4.5 x 4.5 NRP	652	
1	EA	STOREROOM LOCKSET	F07	626	
1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	CLOSER	C02011 OR C02021	689	
1	EA	KICK PLATE	12" X 2" LDW .050 B4E	630	
1	EA	STOP	L52101 OR L52251	630	

FUNCTION: LATCHBOLT RETRACTED BY LEVER INSIDE ONLY. OUTSIDE LEVER IS ALWAYS RIGID. KEY OUTSIDE RETRACTS LATCHBOLT. DEADLOCKING LATCHBOLT.

HW SET: 034K

3	EA	HINGES	BY DOOR SUPPLIER	630	
1	EA	POWER TRANSFER	EPT-2	689	VON
1	EA	ELECTRIC MORT LOCK	SERIES 1000 GRADE 1		
			FAIL SECURE	626	
1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	CLOSER	C02011 OR C02021	689	
1	EA	KICK PLATE	12" X 2" LDW .050 B4E	630	
1	EA	STOP	L52101 OR L52251	630	
1	EA	SOUND SEAL	BY DOOR SUPPLIER		
1	EA	AUTO DR BOTTOM	BY DOOR SUPPLIER		
1	EA	THRESHOLD	BY DOOR SUPPLIER		
1	EA	POWER SUPPLY	510 X EIR X DCM1	GRY	LOC
1	EA	WIRE DIAGRAM	BY HARDWARE SUPPLIER		XXX
1	EA	CARD READER	BY OTHERS		XXX

FUNCTION: LATCHBOLT RETRACTED BY LEVER INSIDE OR BY OUTSIDE LEVER FOLLOWING

THE PRESENTATION OF A VALID CREDENTIAL. DEADLOCKING LATCHBOLT.

HW SET: 034L

3	EA	HINGES	A8112 4.5 X 4.5 NRP	652	
1	EA	POWER TRANSFER	EPT-2	689	VON
1	EA	ELECTRIC MORT LOCK	SERIES 1000 GRADE 1		
		FAIL SECURE		626	
1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	CLOSER	C02011 OR C02021	689	
1	EA	KICK PLATE	12" X 2" LDW .050 B4E	630	
1	EA	STOP	L52101 OR L52251	630	
1	EA	SMOKE GASKET	R0U154	BRN	
1	EA	POWER SUPPLY	510 X EIR X DCM1	GRY	LOC
1	EA	WIRE DIAGRAM	BY HARDWARE SUPPLIER		XXX
1	EA	CARD READER	BY OTHERS		XXX

FUNCTION: LATCHBOLT RETRACTED BY LEVER INSIDE OR BY OUTSIDE LEVER FOLLOWING THE PRESENTATION OF A VALID CREDENTIAL. DEADLOCKING LATCHBOLT.

HW SET: 043

6	EA	HINGES	A8112 4.5 X 4.5 NRP	652	
1	EA	FLUSHBOLTS	AUTOMATIC	626	
1	EA	DUST PROOF STRIKE	AS REQUIRED	626	
1	EA	CLASSROOM LOCKSET	F05	626	
1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	COORDINATOR	COR COMPLETE	600	GLY
2	EA	CLOSER	C02011 OR C02021	689	
2	EA	KICK PLATE	12" X 1" LDW .050 B4E	630	
2	EA	STOP	L52101 OR L52251	630	

FUNCTION: LATCHBOLT RETRACTED BY LEVER EITHER SIDE UNLESS OUTSIDE LEVER IS LOCKED BY KEY. DEADLOCKING LATCHBOLT.

HW SET: 043A

6	EA	HINGES	A8112 4.5 X 4.5 NRP	652	
1	EA	FLUSHBOLTS	AUTOMATIC	626	
1	EA	DUST PROOF STRIKE	AS REQUIRED	626	
1	EA	CLASSROOM LOCKSET	F05	626	
1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	COORDINATOR	COR COMPLETE	600	GLY
1	SET	SEALS	S77	BRN	PEM
2	EA	CLOSER	C02011 OR C02021	689	
2	EA	KICK PLATE	12" X 1" LDW .050 B4E	630	
2	EA	STOP	L52101 OR L52251	630	
1	EA	SMOKE GASKET	R0U154	BRN	

FUNCTION: LATCHBOLT RETRACTED BY LEVER EITHER SIDE UNLESS OUTSIDE LEVER IS LOCKED BY KEY. DEADLOCKING LATCHBOLT.

HW SET: 043B

6	EA	HINGES	A8112 4.5 X 4.5 NRP	652	
1	EA	FLUSHBOLTS	AUTOMATIC	626	
1	EA	DUST PROOF STRIKE	AS REQUIRED	626	
1	EA	CLASSROOM LOCKSET	F05	626	



1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	COORDINATOR	COR COMPLETE	600	GLY
2	EA	TRASH CLOSER	C02011 OR 180 DEG SWING	689	
2	EA	KICK PLATE	12" X 1" LDW .050 B4E	630	
2	EA	WALL STOP & HOLDER		626	

FUNCTION: LATCHBOLT RETRACTED BY LEVER EITHER SIDE UNLESS  
OUTSIDE LEVER IS LOCKED BY KEY. DEADLOCKING LATCHBOLT.

## HW SET: 043C

6	EA	HINGES	A8112 4.5 X 4.5 NRP	652	
1	EA	FLUSHBOLTS	AUTOMATIC	626	
1	EA	DUST PROOF STRIKE	AS REQUIRED	626	
1	EA	CLASSROOM LOCKSET	F05	626	
1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	COORDINATOR	COR COMPLETE	600	GLY
2	EA	CLOSER	C02011 OR C02021	689	
2	EA	OVERHEAD STOP	C02541	630	
2	EA	KICK PLATE	12" X 1" LDW .050 B4E	630	

FUNCTION: LATCHBOLT RETRACTED BY LEVER EITHER SIDE UNLESS  
OUTSIDE LEVER IS LOCKED BY KEY. DEADLOCKING LATCHBOLT.

## HW SET: 044B

6	EA	HINGES	A5111 4.5 X 4.5 NRP	630	
1	EA	FLUSHBOLTS	AUTOMATIC	626	
1	EA	DUST PROOF STRIKE	AS REQUIRED	626	
1	EA	STOREROOM LOCKSET	F07	626	
1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	COORDINATOR	COR COMPLETE	600	GLY
1	EA	ASTRAGAL	BY DOOR SUPPLIER		
2	EA	CLOSER	CUSH N STOP W/ HOLD OPEN	689	
2	EA	KICK PLATE	12" X 1" LDW .050 B4E	630	
1	EA	RAIN DRIP	R3Y976	628	
1	EA	WEATHERSTRIP	ROY165	628	
2	EA	SWEEP	ROY536	628	
1	EA	THRESHOLD	J32130 1/2" X 5"	628	

FUNCTION: LATCHBOLT RETRACTED BY LEVER INSIDE, KEY OUTSIDE  
OUTSIDE LEVER IS ALWAYS RIGID. DEADLOCKING LATCHBOLT.

## HW SET: 044C

6	EA	HINGES	A8112 4.5 X 4.5 NRP	652	
1	EA	POWER TRANSFER	EPT-2	689	VON
1	EA	FLUSHBOLTS	AUTOMATIC	626	
1	EA	DUST PROOF STRIKE	WITH PLATE	626	
1	EA	ELECTRIC MORT LOCK	SERIES 1000 GRADE 1		
			FAIL SECURE	626	
1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	COORDINATOR	COR COMPLETE	600	GLY
1	SET	SEALS	S77	BRN	PEM
2	EA	CLOSER	C02101 PT4D	689	
2	EA	KICK PLATE	12" X 1" LDW .050 B4E	630	
2	EA	STOP	L52101 OR L52251	630	
1	EA	SMOKE GASKET	R0U154	BRN	
1	EA	POWER SUPPLY	510 X EIR X DCM1	GRY	LOC

1 EA WIRE DIAGRAM BY HARDWARE SUPPLIER XXX  
 1 EA CARD READER BY OTHERS XXX  
 FUNCTION: LATCHBOLT RETRACTED BY LEVER INSIDE OR BY OUTSIDE LEVER FOLLOWING  
 THE PRESENTATION OF A VALID CREDENTIAL. DEADLOCKING LATCHBOLT.

## HW SET: 051A

3 EA HINGES A8112 4.5 X 4.5 NRP 652  
 1 EA FIRE EXIT DEVICE TYPE 01 FUNCTION 01 626  
 1 EA IC CYLINDER AS REQUIRED 626 BES  
 1 EA CLOSER C02011 OR C02021 689  
 1 EA KICK PLATE 12" X 2" LDW .050 B4E 630  
 1 EA STOP L52101 OR L52251 630  
 1 EA SMOKE GASKET ROU154 BRN  
 1 EA EXIT ALARM EA2500 AL DET  
 1 EA DOOR CONTACT SWITCH MS2049F DET  
 1 EA TRANSFORMER PP-5152-3 DET  
 FUNCTION: LATCHBOLT RETRACTED BY INSIDE TOUCHPAD. EXIT DEVICE PUSH PAD  
 SIGNAGAE TO INCLUDE THE FOLLOWNG: "EMERGENCY EXIT ONLY - PUSH TO OPEN AND  
 SOUND ALARM" SIGNAGE IS PART OF EXIT DEVICE.

## HW SET: 051B

3 EA HINGES BY DOOR SUPPLIER 652  
 1 EA PANIC DEVICEE TYPE 01 FUNCTION 01 626  
 1 EA IC CYLINDER AS REQUIRED 626 BES  
 1 EA CLOSER C02011 OR C02021 689  
 1 EA KICK PLATE 12" X 2" LDW .050 B4E 630  
 1 EA STOP L52101 OR L52251 630  
 1 EA SOUND SEALS BY DOOR SUPPLIER  
 1 EA AUTO DR BOTTOM BY DOOR SUPPLIER  
 1 EA THRESHOLD BY DOOR SUPPLIER  
 1 EA EXIT ALARM EA2500 AL DET  
 1 EA DOOR CONTACT SWITCH MS2049F DET  
 1 EA TRANSFORMER PP-5152-3 DET  
 FUNCTION: LATCHBOLT RETRACTED BY INSIDE TOUCHPAD. EXIT DEVICE PUSH PAD  
 SIGNAGE TO INCLUDE THE FOLLOWING: "EMERGENCY EXIT ONLY - PUSH TO OPEN AND  
 SOUND ALARM" SIGNAGE IS PART OF EXIT DEVICE.

## HW SET: 053A

3 EA HINGES A8112 4.5 X 4.5 NRP 652  
 1 EA FIRE EXIT DEVICE TYPE 08 FUNCTION 08 626  
 1 EA IC CYLINDER AS REQUIRED 626 BES  
 1 EA CLOSER C02021 PT4D 689  
 1 EA KICK PLATE 12" X 2" LDW .050 B4E 630  
 1 EA MAGNETIC HOLD OPEN SEM7800 LCN  
 1 EA SMOKE GASKET ROU154 BRN  
 FUNCTION: LATCHBOLT RETRACTED BY EXIT DEVICE TOUCH PAD INSIDE,  
 KEY LOCKS OR UNLOCKS OUTSIDE LEVER

## HW SET: 054A

3 EA HINGES BY DOOR SUPPLIER 630  
 1 EA FIRE EXIT DEVICE TYPE 01 FUNCTION 01 626

1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	CLOSER	TYPE C02021 W/STOP ARM	689	
1	EA	KICK PLATE	12" X 2" LDW .050 B4E	630	
1	EA	SOUND SEALS	BY DOOR SUPPLIER		
1	EA	RAIN DRIP	R3Y976	628	
1	EA	AUTO DR BOTTOM	BY DOOR SUPPLIER		
1	EA	THRESHOLD	BY DOOR SUPPLIER		
1	EA	DOOR CONTACT SWITCH	BY OTHERS		XXX
1	EA	EXIT ALARM	EA2500	AL	DET
1	EA	DOOR CONTACT SWITCH	MS2049F		DET
1	EA	TRANSFORMER	PP-5152-3		DET

FUNCTION: LATCHBOLT RETRACTED BY EXIT DEVICE TOUCH PAD INSIDE, EXIT DEVICE PUSH PAD SIGNAGE TO INCLUDE THE FOLLOWING: "EMERGENCY EXIT ONLY - PUSH TO OPEN AND SOUND ALARM" SIGNAGE IS PART OF EXIT DEVICE.

## HW SET: 054B

1	EA	PIVOT SET	C07131	626	
1	EA	POWER TRANSFER	EPT-2	689	VON
1	EA	PANIC DEVICE	CDLX99NL-0P	626	VON
2	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	STAIGHT PULL	1" X 10" 2-1/2"		
			PROJ X THRU BOLT	630	
1	EA	OPERATOR	4642	689	LCN
1	EA	HD OVERHEAD STOP	C11541	630	
1	EA	RAIN DRIP	R3Y976	628	
1	EA	WEATHERSTRIP	BY DR/FR SUPPLIER		
1	EA	SWEEP	ROY536	628	
1	EA	THRESHOLD	J32100 1/2" X 5"	AL	
1	EA	WALL PLATE SWITCH	7910-952	689	LCN
1	EA	BOLLARD POST	7910-966	689	LCN
1	EA	ACTUATOR	7910-918		LCN
1	EA	WIRE DIAGRAM	BY HARDWARE SUPPLIER		XXX

FUNCTION: LATCHBOLT RETRACTED BY KEY OUTSIDE, TOUCH PAD INSIDE OR BY KEY OUTSIDE. COMMON WIRE OF ACTUATORS WIRED IN SERIES WITH THE LX SWITCH IN PANIC DEVICE.

## HW SET: 054C

	EA	HINGES	BY DOOR SUPPLIER	630	
1	EA	PANIC DEVICE	TYPE 01 FUNCTION 01	626	
1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	CLOSER	TYPE C02021 W/STOP ARM	689	
1	EA	SOUND SEALS	BY DOOR SUPPLIER		
1	EA	RAIN DRIP	R3Y976	628	
1	EA	AUTO DR BOTTOM	BY DOOR SUPPLIER		
1	EA	THRESHOLD	BY DOOR SUPPLIER		
1	EA	DOOR CONTACT SWITCH	BY OTHERS		XXX
1	EA	EXIT ALARM	EA2500	AL	DET
1	EA	DOOR CONTACT SWITCH	MS2049F		DET
1	EA	TRANSFORMER	PP-5152-3		DET

FUNCTION: LATCHBOLT RETRACTED BY TOUCH PAD INSIDE, EXIT ONLY EXIT DEVICE PUSH PAD SIGNAGE TO INCLUDE THE FOLLOWING: "EMERGENCY EXIT ONLY - PUSH TO OPEN AND SOUND ALARM" SIGNAGE IS PART OF EXIT DEVICE.

## HW SET: 054D

3	EA	HINGES	A5111 4.5 X 4.5 NRP	630	
1	EA	PANIC DEVICE	TYPE 01 FUNCTION 03 L/TRIM	626	
1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	STRAIGHT PULL	1" X 10" 2-1/2" PROJ X THRU BOLT	630	
1	EA	CLOSER	TYPE C02021 W/STOP ARM	689	
1	EA	KICK PLATE	12" X 2" LDW .050 B4E	630	
1	EA	RAIN DRIP	R3Y976	628	
1	EA	WEATHERSTRIP	ROY165	628	
1	EA	SWEEP	ROY536	628	
1	EA	THRESHOLD	J32130	628	

FUNCTION: LATCHBOLT RETRACTED BY TOUCH PAD INSIDE, KEY OUTSIDE

HW SET: 054E

1	EA	PIVOT SET	C07131	626	
1	EA	PANIC DEVICE	TYPE 01 FUNCTION 01		
			W/CYL DOGGING	626	
1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	CLOSER	C02101 PT4D	689	
1	EA	HD OVERHEAD STOP	C11541	630	
1	EA	RAIN DRIP	R3Y976	628	
1	EA	WEATHERSTRIP	BY DR/FR SUPPLIER		
1	EA	SWEEP	ROY536	628	
1	EA	THRESHOLD	J32130	628	
1	EA	EXIT ALARM	EA2500	AL	DET
1	EA	DOOR CONTACT SWITCH	MS2049F		DET
1	EA	TRANSFORMER	PP-5152-3		DET

FUNCTION: LATCHBOLT RETRACTED BY TOUCH PADD INSIDE EXIT DEVICE PUSH PAD  
SIGNAGE TO INCLUDE THE FOLLOWING: "EMERGENCY EXIT ONLY - PUSH TO OPEN AND  
SOUND ALARM" SIGNAGE IS PART OF EXIT DEVICE.

HW SET: 054F

1	EA	PIVOT SET	C07131	626	
1	EA	POWER TRANSFER	EPT-2	689	VON
1	EA	PANIC HARDWARE	EL99NL-OP	626	VON
1	EA	CYPHER LOCK	CDX-09	626	SIM
1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	STRAIGHT PULL	1" X 10" 2-1/2"		
			PROJ X THRU BOLT	630	
1	EA	OPERATOR	4642	689	LCN
1	EA	HD OVERHEAD STOP	C11541	630	
1	EA	WALL PLATE SWITCH	7910-956	630	LCN
1	EA	ACTUATOR	7910-918		LCN
1	EA	INTERFACE BOX	JB7-R2	GRY	VON
1	EA	POWER SUPPLY	PS873-2	GRY	VON
1	EA	PUSHBUTTON	623RD LOCATE IN SECURITY OFFICE	630	LOC
1	EA	WIRE DIAGRAM	BY HARDWARE SUPPLIER		XXX
1	EA	CARD READER	BY OTHERS		XXX
1	EA	DOOR CONTACT SWITCH	BY OTHERS		XXX

FUNCTION: LATCHBOLT RETRACTED BY KEY OUTSIDE, TOUCH PAD INSIDE VALID  
CREDENTIAL WILL MOMENTARILY UNLOCK THE DOOR AND ACTIVATE THE EXTERIOR WALL  
PLATE ACTUATOR. REMOTE BUTTON WILL UNLOCK AND OPEN THE DOOR. INTERIOR WALL  
PLATE ACTUATOR WILL UNLOCK AND OPEN DOOR.

## HW SET: 054G

1	EA	PIVOT SET	C07131	626	
1	EA	PANIC DEVICE	TYPE 01 FUNCTION 01	626	
1	EA	STAIGHT PULL	1" X 10" 2-1/2"		
			PROJ X THRU BOLT	630	
1	EA	CLOSER	C02101 PT4D	689	
1	EA	HD OVERHEAD STOP	C11541	630	
1	EA	DOOR CONTACT SWITCH	BY OTHERS		XXX

FUNCTION: LATCHBOLT RETRACTED BY TOUCH PAD INSIDE

## HW SET: 054H

3	EA	HINGES	A5111 4.5 X 4.5 NRP	630	
1	EA	PANIC DEVICE	TYPE 01 FUNCTION 01	626	
1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	CLOSER	TYPE C02021 W/STOP ARM	689	
1	EA	RAIN DRIP	R3Y976	628	
1	EA	WEATHERSTRIP	BY DR/FR SUPPLIER		
1	EA	SWEEP	ROY536	628	
1	EA	THRESHOLD	J32100 1/2" X 5"	AL	
1	EA	EXIT ALARM	EA2500	AL	DET
1	EA	DOOR CONTACT SWITCH	MS2049F		DET
1	EA	TRANSFORMER	PP-5152-3		DET

FUNCTION: LATCHBOLT RETRACTED BY TOUCH PAD INSIDE  
 EXIT DEVICE PUSH PAD SIGNAGE TO INCLUDE THE FOLLOWING:  
 "EMERGENCY EXIT ONLY - PUSH TO OPEN AND SOUND ALARM"  
 SIGNAGE IS PART OF EXIT DEVICE

## HW SET: 054J

4	EA	HINGES	BY DOOR SUPPLIER	630	
1	EA	FIRE EXIT DEVICE	TYPE 01 FUNCTION 01	626	
1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	CLOSER	TYPE C02021 W/STOP ARM	689	
1	EA	KICK PLATE	12" X 2" LDW .050 B4E	630	
1	EA	SOUND SEALS	BY DOOR SUPPLIER		
1	EA	AUTO DR BOTTOM	BY DOOR SUPPLIER		
1	EA	THRESHOLD	BY DOOR SUPPLIER		
1	EA	EXIT ALARM	EA2500	AL	DET
1	EA	DOOR CONTACT SWITCH	MS2049F		DET
1	EA	TRANSFORMER	PP-5152-3		DET

FUNCTION: LATCHBOLT RETRACTED BY EXIT DEVICE TOUCH PAD INSIDE,  
 EXIT DEVICE PUSH PAD SIGNAGE TO INCLUDE THE FOLLOWING:  
 "EMERGENCY EXIT ONLY - PUSH TO OPEN AND SOUND ALARM"  
 SIGNAGE IS PART OF EXIT DEVICE

## HW SET: 054K

3	EA	HINGES	BY DOOR SUPPLIER	630	
1	EA	POWER TRANSFER	EPT-2	689	VON
1	EA	PANIC HARDWARE	EL99NL-OP	626	VON
1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	STAIGHT PULL	1" X 10" 2-1/2"		
			PROJ X THRU BOLT	630	
1	EA	CLOSER	C02101 PT4D	689	

1	EA	KICK PLATE	12" X 2" LDW .050 B4E	630	
1	EA	STOP	L52101 OR L52251	630	
1	EA	SOUND SEALS	BY DOOR SUPPLIER		
1	EA	AUTO DR BOTTOM	BY DOOR SUPPLIER		
1	EA	THRESHOLD	BY DOOR SUPPLIER		
1	EA	POWER SUPPLY	PS873-2	GRY	VON
1	EA	WIRE DIAGRAM	BY HARDWARE SUPPLIER		XXX
1	EA	CARD READER	BY OTHERS		XXX

FUNCTION: LATCHBOLT RETRACTED BY KEY OUTSIDE, TOUCH PAD INSIDE  
VALID CREDENTIAL WILL MOMENTARILY UNLOCK THE DOOR

HW SET: 054L

4	EA	HINGES	BY DOOR SUPPLIER	630	
1	EA	POWER TRANSFER	EPT-2	689	VON
1	EA	FIRE EXIT DEVICE	EL99NL-OP-F	626	VON
1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	STAIGHT PULL	1" X 10" 2-1/2"		
			PROJ X THRU BOLT	630	
1	EA	CLOSER	C02101 PT4D	689	
1	EA	KICK PLATE	12" X 2" LDW .050 B4E	630	
1	EA	STOP	L52101 OR L52251	630	
1	EA	SOUND SEALS	BY DOOR SUPPLIER		
1	EA	AUTO DR BOTTOM	BY DOOR SUPPLIER		
1	EA	THRESHOLD	BY DOOR SUPPLIER		
1	EA	POWER SUPPLY	PS873-2	GRY	VON
1	EA	WIRE DIAGRAM	BY HARDWARE SUPPLIER		XXX
1	EA	CARD READER	BY OTHERS		XXX

FUNCTION: LATCHBOLT RETRACTED BY KEY OUTSIDE, TOUCH PAD INSIDE  
VALID CREDENTIAL WILL MOMENTARILY UNLOCK THE DOOR

HW SET: 054M

4	EA	HINGES	A5111 4.5 X 4.5	NRP	630
1	EA	FIRE EXIT DEVICE	TYPE 01 FUNCTION 03 L/TRIM	626	
1	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	STAIGHT PULL	1" X 10" 2-1/2"		
			PROJ X THRU BOLT	630	
1	EA	CLOSER	TYPE C02021 W/STOP ARM	689	
1	EA	KICK PLATE	12" X 2" LDW .050 B4E	630	
1	EA	RAIN DRIP	R3Y976	628	
1	EA	WEATHERSTRIP	ROY165	628	
1	EA	SWEEP	ROY536	628	
1	EA	THRESHOLD	J32100 1/2" X 5"	AL	
1	EA	DOOR CONTACT SWITCH	BY OTHERS		XXX

FUNCTION: LATCHBOLT RETRACTED BY EXIT DEVICE TOUCH PAD INSIDE,  
OR BY KEY OUTSIDE.

HW SET: 064B

6	EA	HINGES	BY DOOR SUPPLIER	630	
1	EA	MULLION	KEY REMOVABLE	600	
2	EA	PANIC DEVICE	TYPE 01 FUNCTION 01	626	
1	EA	IC CYLINDER	AS REQUIRED	626	BES
2	EA	CLOSER	TYPE C02021 W/STOP ARM	689	
1	EA	SOUND SEALS	BY DOOR SUPPLIER		

1	EA	RAIN DRIP	R3Y976	628	
2	EA	AUTO DR BOTTOM	BY DOOR SUPPLIER		
1	EA	THRESHOLD	BY DOOR SUPPLIER		
2	EA	DOOR CONTACT SWITCH	BY OTHERS		XXX
1	EA	EXIT ALARM	EA2500	AL	DET
2	EA	DOOR CONTACT SWITCH	MS2049F		DET
1	EA	TRANSFORMER	PP-5152-3		DET

FUNCTION: LATCHBOLT RETRACTED TOUCH PAD INSIDE

EXIT DEVICE PUSH PAD SIGNAGE TO INCLUDE THE FOLLOWING:

"EMERGENCY EXIT ONLY - PUSH TO OPEN AND SOUND ALARM"

SIGNAGE IS PART OF EXIT DEVICE

HW SET: 064D

6	EA	HINGES	BY DOOR SUPPLIER	630	
1	EA	POWER TRANSFER	EPT-2	689	VON
1	EA	MULLION	KEY REMOVABLE	600	
1	EA	FIRE EXIT DEVICE	EL99NL-OP-F	626	VON
1	EA	FIRE EXIT DEVICE	TYPE 01 FUNCTION 01	626	
2	EA	IC CYLINDER	AS REQUIRED	626	BES
1	EA	STAIGHT PULL	1" X 10" 2-1/2"		
			PROJ X THRU BOLT	630	
2	EA	CLOSER	TYPE C02021 W/STOP ARM	689	
1	EA	SOUND SEALS	BY DOOR SUPPLIER		
2	EA	AUTO DR BOTTOM	BY DOOR SUPPLIER		
1	EA	THRESHOLD	BY DOOR SUPPLIER		
1	EA	POWER SUPPLY	PS873-2	GRY	VON
1	EA	WIRE DIAGRAM	BY HARDWARE SUPPLIER		XXX
1	EA	CARD READER	BY OTHERS		XXX

FUNCTION: LATCHBOLT RETRACTED BY KEY OUTSIDE, TOUCH PAD INSIDE

VALID CREDENTIAL WILL MOMENTARILY UNLOCK THE DOOR

HW SET: 161

3	EA	HINGES	A8112 4.5 X 4.5	630	
1	EA	STRAIGHT PULL	1" X 10" 2-1/2" PROJ X THRU BOLT	630	
1	EA	PUSH PLATE	4" X 16" .050 B4E	630	
1	EA	CLOSER	C02011 OR C02021	689	
1	EA	KICK PLATE	12" X 2" LDW .050 B4E	630	
1	EA	STOP	L52101 OR L52251	630	

FUNCTION: SINGLE DOOR PUSH AND PULL

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SECTION 08800

GLAZING

10/03

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## SECTION 08800

GLAZING  
10/03

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97.1 (1984; R 1994) Safety Glazing Materials  
Used in Buildings

## ASTM INTERNATIONAL (ASTM)

ASTM C 509 (2000) Elastomeric Cellular Preformed  
Gasket and Sealing Material

ASTM C 864 (1999) Dense Elastomeric Compression Seal  
Gaskets, Setting Blocks, and Spacers

ASTM C 920 (2002) Elastomeric Joint Sealants

ASTM C 1036 (2001) Flat Glass

ASTM C 1172 (1996e1) Laminated Architectural Flat Glass

ASTM C 1184 (2000ae1) Structural Silicone Sealants

ASTM C 1376 (2003) Pyrolytic and Vacuum Deposition  
Coatings on Flat Glass

ASTM C 1401 (2002) Structural Sealant Glazing

ASTM D 395 (2001) Rubber Property - Compression Set

ASTM E 773 (2001) Accelerated Weathering of Sealed  
Insulating Glass Units

ASTM E 774 (1997) Sealed Insulating Glass Units

ASTM E 1300 (2002) Determining Load Resistance of  
Glass in Buildings

## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

16 CFR 1201 Architectural Glazing Materials

## GLASS ASSOCIATION OF NORTH AMERICA (GANA)

GANA Glazing Manual (1997) Glazing Manual

GANA Sealant Manual

(1990) Sealant Manual

## INSULATING GLASS MANUFACTURERS ALLIANCE (IGMA)

IGMA A1202

(1983) Commercial Insulating Glass  
Dimensional Tolerances

IGMA TM-3000

(1997) Glazing Guidelines for Sealed  
Insulating Glass Units

IGMA TB-3001

(1990) IGMA Guidelines for Sloped Glazing

## U.S. DEPARTMENT OF DEFENSE (DoD)

UFC 4-010-01

(8 October 2003) Unified Facilities  
Criteria DoD Minimum Antiterrorism  
Standards for Buildings.

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-02 Shop Drawings

## Installation

Drawings showing complete details of the proposed setting methods, mullion details, edge blocking, size of openings, frame details, materials, and types and thickness of glass.

## SD-03 Product Data

## Insulating Glass

## Glazing Accessories

Manufacturer's descriptive product data, handling and storage recommendations, installation instructions, and cleaning instructions.

## SD-04 Samples

## Insulating Glass

## Glazing Tape

## Sealant

Two 8 x 10 inch samples of each of the following: each type of laminated acoustical assembly.

Three samples of each indicated material. Samples of plastic sheets shall be minimum 5 by 7 inches.

## SD-08 Manufacturer's Instructions

### Setting and sealing materials

#### Glass setting

Submit glass manufacturer's recommendations for setting and sealing materials and for installation of each type of glazing material specified.

## 1.3 SYSTEM DESCRIPTION

### 1.3.1 General Description

Glazing systems shall be fabricated and installed watertight and airtight to withstand thermal movement and wind loading without glass breakage, gasket failure, deterioration of glazing accessories, and defects in the work. Glazed systems shall comply with the safety standards, as indicated in accordance with ANSI Z97.1. Glazed systems shall comply with indicated wind/snow loading in accordance with ASTM E 1300.

### 1.3.2 DoD Standard Description

Glazing systems and materials to comply with Unified Facilities Criteria (UFC 4-010-01) DoD Minimum Antiterrorism Standards for Buildings, dated 8 October, 2003.

### 1.3.3 Glazing Frame Bite

The glazing materials shall have a minimum frame bite of 3/8 inch for structurally glazed systems and 1 inch for window systems that are not structurally glazed.

### 1.3.4 Laminated Acoustical Assembly

Laminated acoustical assemblies for glazing systems require acoustical testing to an estimated STC 45 level.

## 1.4 DELIVERY, STORAGE, AND HANDLING

Deliver products to the site in unopened containers, labeled plainly with manufacturers' names and brands. Store glass and setting materials in safe, enclosed dry locations and do not unpack until needed for installation. Handle and install materials in a manner that will protect them from damage.

## 1.5 ENVIRONMENTAL REQUIREMENTS

Do not start glazing work until the outdoor temperature is above 40 degrees F and rising, unless procedures recommended by the glass manufacturer and approved by the Contracting Officer are made to warm the glass and rabbet surfaces. Provide ventilation to prevent condensation of moisture on glazing work during installation. Do not perform glazing work during damp or rainy weather.

## 1.6 WARRANTY

### 1.6.1 Warranty for Insulating Glass Units

Warranty insulating glass units against development of material obstruction to vision (such as dust, fogging, or film formation on the inner glass surfaces) caused by failure of the hermetic seal, other than through glass breakage, for a 5-year period following acceptance of the work. Provide new units for any units failing to comply with terms of this warranty within 45 working days after receipt of notice from the Government.

## PART 2 PRODUCTS

### 2.1 GLASS

ASTM C 1036, unless specified otherwise. In doors and sidelights, provide safety glazing material conforming to 16 CFR 1201.

#### 2.1.1 Clear Glass

Type I, Class 1 (clear), Quality q4 (A). Provide for glazing openings not indicated or specified otherwise. Use double-strength sheet glass or 1/8 inch float glass for openings up to and including 15 square feet, 3/16 inch for glazing openings over 15 square feet but not over 30 square feet, and 1/4 inch for glazing openings over 30 square feet but not over 45 square feet.

#### 2.1.2 Annealed Glass

Annealed glass shall be Type I transparent flat type, Class 1 - clear and tinted, Quality q3 - glazing select, conforming to ASTM C 1036. Color shall be as specified in GLAZING TYPE SCHEDULE.

#### 2.1.3 Laminated Glass

ASTM C 1172, Kind LA fabricated from scheduled pieces of Type I, Class 1, Quality q3, flat annealed transparent glass conforming to ASTM C 1036. Flat glass shall be laminated together with a minimum of 0.060 inch thick, clear polyvinyl butyral interlayer.

#### 2.1.4 Mirrors

##### 2.1.4.1 Glass Mirrors

Glass for mirrors shall be Type I transparent flat type, Class 1-clear, Glazing Quality q1, 1/4 inch thick conforming to ASTM C 1036. Glass color shall be clear. Glass shall be coated on one surface with silver coating, copper protective coating, and mirror backing paint. Silver coating shall be highly adhesive pure silver coating of a thickness which shall provide reflectivity of 83 percent or more of incident light when viewed through 1/4 inch thick glass, and shall be free of pinholes or other defects. Copper protective coating shall be pure bright reflective copper, homogeneous without sludge, pinholes or other defects, and shall be of proper thickness to prevent "adhesion pull" by mirror backing paint. Mirror backing paint shall consist of two coats of special scratch and abrasion-resistant paint, and shall be baked in uniform thickness to provide a protection for silver and copper coatings which will permit normal cutting and edge fabrication.

## 2.2 LOW E COATING

Sputter applied, low emissivity, coating of a thin metal or metallic layer, deposited uniformly on glazing surface as specified, 8-10 mils thick conforming to ASTM C 1376.

## 2.3 CERAMIC FRIT

Fired non-lead ceramic enamel paint frit applied to glazing surface as specified. Thickness of coating appropriate to pattern. See Section 09915 COLOR SCHEDULE for pattern/color.

## 2.4 INSULATING GLASS UNITS

Two panes of glass separated by a dehydrated airspace and hermetically sealed. Dimensional tolerances shall be as specified in IGMA A1202. The units shall conform to ASTM E 773 and ASTM E 774, Class A. Spacer shall be roll-formed, with bent or tightly welded or keyed and sealed joints to completely seal the spacer periphery and eliminate moisture and hydrocarbon vapor transmission into airspace through the corners. Primary seal shall be compressed polyisobutylene and the secondary seal shall be a specially formulated silicone.

## 2.5 SETTING AND SEALING MATERIALS

Provide as specified in the GANA Glazing Manual, IGMA TM-3000, IGMA TB-3001, and manufacturer's recommendations, unless specified otherwise herein. Do not use metal sash putty, nonskinning compounds, nonresilient preformed sealers, or impregnated preformed gaskets. Materials exposed to view and unpainted shall be gray or neutral color.

### 2.5.1 Sealants

Provide elastomeric sealants.

#### 2.5.1.1 Elastomeric Sealant

ASTM C 920, Type S or M, Grade NS, Class 12.5, Use G. Use for channel or stop glazing metal sash. Sealant shall be chemically compatible with setting blocks, edge blocks, and sealing tapes, with sealants used in manufacture of insulating glass units. Color of sealant shall be as selected.

#### 2.5.1.2 Structural Sealant for Laminated Acoustical Assembly

ASTM C 1184.

### 2.5.2 Preformed Channels

Neoprene, vinyl, or rubber, as recommended by the glass manufacturer for the particular condition.

### 2.5.3 Sealing Tapes

Preformed, semisolid, polymeric-based material of proper size and compressibility for the particular condition. Use only where glazing rabbet is designed for tape and tape is recommended by the glass or sealant manufacturer. Provide spacer shims for use with compressible tapes. Tapes

shall be chemically compatible with the product being set.

#### 2.5.4 Setting Blocks and Edge Blocks

Neoprene setting blocks shall be dense extruded type conforming to ASTM D 395, Method B, Shore A durometer between 70 and 90. Edge blocking shall be Shore A durometer of 50 (+ or - 5). Silicone setting blocks shall be required when blocks are in contact with silicone sealant. Profiles, lengths and locations shall be as required and recommended in writing by glass manufacturer.

#### 2.5.5 Glazing Gaskets

Glazing gaskets shall be extruded with continuous integral locking projection designed to engage into metal glass holding members to provide a watertight seal during dynamic loading, building movements and thermal movements. Glazing gaskets for a single glazed opening shall be continuous one-piece units with factory-fabricated injection-molded corners free of flashing and burrs. Glazing gaskets shall be in lengths or units recommended by manufacturer to ensure against pull-back at corners. Glazing gasket profiles shall be as indicated on drawings.

##### 2.5.5.1 Fixed Glazing Gaskets

Fixed glazing gaskets shall be closed-cell (sponge) smooth extruded compression gaskets of cured elastomeric virgin neoprene compounds conforming to ASTM C 509, Type 2, Option 1.

##### 2.5.5.2 Wedge Glazing Gaskets

Wedge glazing gaskets shall be high-quality extrusions of cured elastomeric virgin neoprene compounds, ozone resistant, conforming to ASTM C 864, Option 1, Shore A durometer between 65 and 75.

##### 2.5.5.3 Aluminum Framing Glazing Gaskets

Glazing gaskets for aluminum framing shall be permanent, elastic, non-shrinking, non-migrating, watertight and weathertight.

#### 2.5.6 Accessories

Provide as required for a complete installation, including glazing points, clips, shims, angles, beads, and spacer strips. Provide noncorroding metal accessories. Provide primer-sealers and cleaners as recommended by the glass and sealant manufacturers.

#### 2.6 MIRROR ACCESSORIES

##### 2.6.1 Mastic

Mastic for setting mirrors shall be a polymer type mirror mastic resistant to water, shock, cracking, vibration and thermal expansion. Mastic shall be compatible with mirror backing paint, and shall be approved by mirror manufacturer.

##### 2.6.2 Mirror Frames

Mirrors shall be provided with mirror frames (J-mold channels) fabricated of one-piece roll-formed Type 304 stainless steel with No. 4 brushed satin



finish and concealed fasteners which will keep mirrors snug to wall. Frames shall be 1-1/4 x 1/4 x 1/4 inch continuous at top and bottom of mirrors. Concealed fasteners of type to suit wall construction material shall be provided with mirror frames.

### 2.6.3 Mirror Clips

Concealed fasteners of type to suit wall construction material shall be provided with clips.

## PART 3 EXECUTION

### 3.1 PREPARATION

Preparation, unless otherwise specified or approved, shall conform to applicable recommendations in the GANA Glazing Manual, GANA Sealant Manual, IGMA TB-3001, IGMA TM-3000, and manufacturer's recommendations. Determine the sizes to provide the required edge clearances by measuring the actual opening to receive the glass. Grind smooth in the shop glass edges that will be exposed in finish work. Leave labels in place until the installation is approved, except remove applied labels on heat-absorbing glass and on insulating glass units as soon as glass is installed. Securely fix movable items or keep in a closed and locked position until glazing compound has thoroughly set.

### 3.2 GLASS SETTING

Shop glaze or field glaze items to be glazed using glass of the quality and thickness specified or indicated. Glazing, unless otherwise specified or approved, shall conform to applicable recommendations in the GANA Glazing Manual, GANA Sealant Manual, IGMA TB-3001, IGMA TM-3000, and manufacturer's recommendations. Aluminum windows with laminated acoustical assemblies shall be in conformance with UFC 4-010-01. Handle and install glazing materials in accordance with manufacturer's instructions. Use beads or stops which are furnished with items to be glazed to secure the glass in place.

#### 3.2.1 Sheet Glass

Cut and set with the visible lines or waves horizontal.

#### 3.2.2 Insulating Glass Units

Do not grind, nip, or cut edges or corners of units after the units have left the factory. Springing, forcing, or twisting of units during setting will not be permitted. Handle units so as not to strike frames or other objects. Installation shall conform to applicable recommendations of IGMA TB-3001 and IGMA TM-3000.

#### 3.2.3 Installation of Laminated Acoustical Assembly Types

Sashes which are to receive laminated glass shall be weeped to the outside to allow water drainage into the channel. Install in wet glazing application using ASTM C 1184 compliant sealant and application in conformance with ASTM C 1401.

### 3.3 CLEANING

Clean glass surfaces and remove labels, paint spots, putty, and other

defacement as required to prevent staining. Glass shall be clean at the time the work is accepted.

### 3.4 PROTECTION

Glass work shall be protected immediately after installation. Glazed openings shall be identified with suitable warning tapes, cloth or paper flags, attached with non-staining adhesives. Reflective glass shall be protected with a protective material to eliminate any contamination of the reflective coating. Protective material shall be placed far enough away from the coated glass to allow air to circulate to reduce heat buildup and moisture accumulation on the glass. Glass units which are broken, chipped, cracked, abraded, or otherwise damaged during construction activities shall be removed and replaced with new units.

### 3.5 GLAZING TYPE SCHEDULE

#### 3.5.1 GT-1 Glazing Type 1

Interior, laminated single pane, clear.

Clear, annealed glass, 3/16 inch thick

Laminate layer, 0.060 inch thick

Clear, annealed glass, 3/16 inch thick

#### 3.5.2 GT-2 Glazing Type 2

Interior, mirror, 1/4 inch thick.

#### 3.5.3 GT-3 Glazing Type 3

Interior, laminated acoustical assembly, clear.

Outboard lite: Clear, annealed glass, 3/16 inch thick  
Laminate layer, 0.060 inch thick  
Clear, annealed glass, 3/16 inch thick

Airspace: 3/4 inch

Inboard lite: Clear, annealed glass, 3/16 inch thick  
Laminate layer, 0.060 inch thick  
Clear, annealed glass, 3/16 inch thick

#### 3.5.4 GT-4 Glazing Type 4

Interior, laminated acoustical assembly, frit.

Outboard lite: Clear, annealed glass, 3/16 inch thick  
Laminate layer, 0.060 inch thick  
Clear, annealed glass, 3/16 inch thick

Airspace: 3/4 inch

Inboard lite: Clear, annealed glass, 3/16 inch thick  
Ceramic frit on #5 surface  
Laminate layer, 0.060 inch thick  
Clear, annealed glass, 3/16 inch thick

## 3.5.5 GT-5 Glazing Type 5

Exterior, laminated acoustical assembly, tinted, Low E

Outboard lite: Gray, annealed glass, 3/16 inch thick  
Laminate layer, 0.060 inch thick  
Clear, annealed glass, 3/16 inch thick  
Low E coating on #4 surface

Airspace: 3/4 inch

Inboard lite: Clear, annealed glass, 3/16 inch thick  
Laminate layer, 0.060 inch thick  
Clear, annealed glass, 3/16 inch thick

## 3.5.6 GT-6 Glazing Type 6

Exterior, laminated acoustical assembly, tinted, Low E, frit.

Outboard lite: Gray, annealed glass, 3/16 inch thick  
Laminate layer, 0.060 inch thick  
Clear, annealed glass, 3/16 inch thick  
Low E coating on #4 surface

Airspace: 3/4 inch

Inboard lite: Clear, annealed glass, 3/16 inch thick  
Ceramic frit on #5 surface  
Laminate layer, 0.060 inch thick  
Clear, annealed glass, 3/16 inch thick

## 3.5.7 GT-7 Glazing Type 7

Exterior Door, laminated non-acoustical assembly, tinted, Low E.

Outboard lite: Gray, tempered glass, 1/4 inch thick  
Low E coating on #2 surface

Airspace: 1/2 inch

Inboard lite: Clear, annealed glass, 3/16 inch thick  
Ceramic frit on #3 surface  
Laminate layer, 0.060 inch thick  
Clear, annealed glass, 3/16 inch thick

## 3.5.8 GT-8 Glazing Type 8

Interior Door, laminated non-acoustical assembly, frit.

Outboard lite: Gray, tempered glass, 1/4 inch thick  
Low E on #2 surface

Airspace: 1/2 inch

Inboard lite: Clear, annealed glass, 3/16 inch thick  
Ceramic frit on #3 surface  
Laminate layer, 0.060 inch thick  
Clear, annealed glass, 3/16 inch thick

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## SECTION 08900

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09/99

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## SECTION 08900

GLAZED CURTAIN WALL  
09/99

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## ALUMINUM ASSOCIATION (AA)

AA ASD1	(1997) Aluminum Standards and Data
AA DAF-45	(1997) Designation System for Aluminum Finishes

## AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA MCWM-1	(1996) Metal Curtain Wall Manual
AAMA CW-10	(1997) Care and Handling of Architectural Aluminum from Shop to Site
AAMA 501	(1994) Exterior Walls
AAMA 609/610	(1993) Cleaning and Maintenance of Architectural Anodized Aluminum
AAMA 800	(1992; Addenda 1994) Sealants

## ASTM INTERNATIONAL (ASTM)

ASTM A 36/A 36M	(2001) Carbon Structural Steel
ASTM A 123/A 123M	(2002) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M	(2001a) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 570/A 570M	(1998) Steel, Sheet and Strip, Carbon, Hot-Rolled
ASTM A 572/A 572M	(2001) High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A 611	(1997) Commercial Steel (CS) Sheet, Carbon, Cold-Rolled
ASTM A 653/A 653M	(2002a) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM B 26/B 26M	(2002) Aluminum-Alloy Sand Castings
ASTM B 85	(1996) Aluminum-Alloy Die Castings
ASTM B 108	(2001a) Aluminum-Alloy Permanent Mold Castings
ASTM B 136	(1984; R 1993) Measurement of Stain Resistance of Anodic Coatings on Aluminum
ASTM B 137	(1995) Measurement of Coating Mass Per Unit Area on Anodically Coated Aluminum
ASTM B 209	(2002a) Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 221	(2002) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B 244	(1997) Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals With Eddy-Current Instruments
ASTM C 1184	(2000ae1) Structural Silicone Sealants
ASTM C 1401	(2002) Structural Sealant Glazing
ASTM C 542	(1994) Lock-Strip Gaskets
ASTM C 864	(1999) Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers
ASTM C 920	(2002) Elastomeric Joint Sealants
ASTM E 34	(1994; R 1998) Chemical Analysis of Aluminum and Aluminum-Base Alloys
ASTM E 283	(1991; R 1999) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E 330	(2002) Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E 331	(2000) Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E 546	(1988; R 1995) Frost Point of Sealed Insulating Glass Units
ASTM E 576	(1988; R 1995) Frost Point of Sealed Insulating Glass Units in the Vertical



## Position

## AMERICAN WELDING SOCIETY (AWS)

AWS A5.10/A5.10M	(1999) Bare Aluminum and Aluminum Alloy Welding Electrodes and Rods
AWS D1.1/D1.1M	(2002) Structural Welding Code - Steel

## U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 4-010-01	(8 October 2003) Unified Facilities Criteria DoD Minimum Antiterrorism Standards for Buildings.
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## 1.2 PERFORMANCE REQUIREMENTS

## 1.2.1 General Performance

Shapes and thicknesses of all framing members, fasteners and hardware shall comply with UFC 4-010-01.

## 1.2.2 Frame Member Design

Steel members shall be designed using ultimate yield stresses and aluminum members shall be designed on a 0.2% offset yield strength. Equivalent static design loads for the window and door members shall be 1 lb per square inch applied to the surface of the glazing and frame. Deformations shall not exceed 1/60th of the unsupported member lengths.

## 1.2.3 Glazing Frame Bite

The glazing shall have a minimum frame bite for installation of 3/8 inch for structurally glazed systems.

## 1.2.4 Connection Design

Equivalent static design loads for connections of the window or doorframe to the surrounding walls associated connections and glazing stop connections shall be 10.8 lbs per square inch for glazing panels with a vision area less than or equal to 10.8 square feet and 4.4 lbs per square inch or glazing panels with a vision area greater than 10.8 square feet but less than or equal to 32 square feet. Loads shall be applied to the surface of the glazing and frame. Connections and hardware may be designed on ultimate strength for steel and 0.2% offset yield strength for aluminum.

## 1.2.5 Aluminum Door and Frames

Provide glazed curtain wall system design to accommodate aluminum doors and frame assemblies as specified in Section 08120 ALUMINUM DOORS AND FRAMES. Provide accessories required for attachment of door assemblies and installation in a weathertight condition.

## 1.3 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

## SD-02 Shop Drawings

## Glazed curtain wall system

Submit for curtain wall system and accessories. Drawings shall indicate in detail all system parts including elevations, full-size sections, framing, jointing, panels, types and thickness of metal, flashing and details, field connections, weep and drainage system, finishes, sealing methods, glazing, glass sizes and details, firestopping insulation materials, and erection details.

## SD-03 Product Data

## Glazed curtain wall system

Include descriptive literature, detailed specifications, and available performance test data.

## SD-05 Design Data

## Calculations

## SD-07 Certificates

## Glazed Curtain Wall System; G-AE

Certificates stating that the glazed curtain wall system complies with the requirements of UFC 4-010-01. Certification includes design of the glazed curtain wall system and accessories, and glazing design to comply with specified loads.

## SD-08 Manufacturer's Instructions

## Glazed curtain wall system

## Insulating glass

## 1.4 REQUIREMENT FOR DESIGN DATA

Submit structural and thermal calculations for complete wall assembly.

## 1.5 QUALITY ASSURANCE

## 1.5.1 Testing Requirements

The components listed below shall have been tested in accordance with the requirements below, and shall meet performance requirements specified.

- a. Joint and Glazing Sealants: Perform tests as required by applicable publications referenced.
- b. Preformed Compression Gaskets and Seals: ASTM C 864.
- c. Preformed Lock-strip Gaskets: ASTM C 542, modified as follows: Heat age specimens seven days at 158 degrees F, in zipped or locked position under full design compression. Unzip, cool for one hour, re-zip, and test lip seal pressure, which shall be

minimum 2.5 pounds per linear inch on any extruded or corner specimen.

- d. Anodized Finishes: Stain resistance, coating weight, and coating thickness tests, ASTM B 136, ASTM B 137, and ASTM B 244, respectively.
- e. Insulating Glass: ASTM E 546 or ASTM E 576 at no frost or dew point.

#### 1.5.2 Factory Tests

Perform the following tests except that where a curtain wall system or component of similar type, size, and design as specified for this project has been previously tested, under the conditions specified herein, the resulting test reports may be submitted in lieu of testing the components.

##### 1.5.2.1 Deflection and Structural Tests

No curtain wall framing member shall deflect, in a direction normal to the plane of the wall, more than  $1/175$  of its clear span or  $3/4$  inch, whichever is less, when tested in accordance with ASTM E 330, except that when a plastered surface will be affected the deflection shall not exceed  $1/360$  of the span. No framing member shall have a permanent deformation in excess of 0.2 percent of its clear span when tested in accordance with ASTM E 330 for a minimum test period of 10 seconds at 1.5 times the design wind pressures specified.

##### 1.5.2.2 Water Penetration Test

No water penetration shall occur when the wall is tested in accordance with ASTM E 331 at a differential static test pressure of 20 percent of the inward acting design wind pressure as specified, but not less than 4 psf. Make provision in the wall construction for adequate drainage to the outside of water leakage or condensation that occurs within the outer face of the wall. Leave drainage and weep openings in members and wall open during test.

##### 1.5.2.3 Air Infiltration Test

Air infiltration through the wall, when tested in accordance with ASTM E 283, shall not exceed 0.06 cfm per square foot of fixed wall area, plus the permissible allowance specified for operable windows within the test area.

#### 1.6 GLAZED CURTAIN WALL SYSTEM REQUIREMENTS

Provide system complete with framing, mullions, trim, panels, glass, glazing, sealants, insulation, fasteners, anchors, accessories, concealed auxiliary members, and attachment devices for securing the wall to the structure as specified or indicated.

##### 1.6.1 Source

Curtain wall system components shall be furnished by one manufacturer or fabricator; however, all components need not be products of the same manufacturer.

### 1.6.2 Design

Thermally improved, unit and mullion system. Fully coordinate system accessories directly incorporated, and adjacent to contiguous related work and insure materials compatibility, deflection limitations, thermal movements, and clearances and tolerances as indicated or specified.

### 1.6.3 Thermal Movement

Fabricate, assemble, and erect system with adequate allowances for expansion and contraction of components and fastenings to prevent buckling damage, joint seal failure, glass breakage, undue stress on fastenings or other detrimental effects. For design purposes, base provisions for thermal movement on assumed ambient temperature range of from 10 degrees F to 86 degrees F.

### 1.6.4 Tolerances

Design and erect wall system to accommodate tolerances in building frame and other contiguous work as indicated or specified. Provide with the following tolerances:

- a. Maximum variation from plane or location shown on approved shop drawings: 1/8 inch per 12 feet of length up to not more than 1/2 inch in any total length.
- b. Maximum offset from true alignment between two identical members abutting end to end in line: 1/16 inch.

### 1.6.5 Structural Requirements

No member shall deflect in a direction parallel to the plane of the wall, when carrying its full design load, more than an amount which will reduce the edge cover or glass bite below 75 percent of the design dimension. No member after deflection under full design load, shall have a clearance between itself and the top of the panel, glass, sash, or other part immediately below it less than 1/8 inch; the clearance between the member and an operable window or door shall be minimum 1/16 inch. Design entire system to withstand the indicated wind and concentrated loads, and the following wind loads acting normal to the plane of the wall: 25 psf acting inward, and the same load acting outward.

### 1.7 QUALIFICATION OF WELDERS

Welding shall be performed by certified welders qualified in accordance with AWS D1.1/D1.1M using procedures, materials, and equipment of the type required for the work.

### 1.8 DELIVERY AND STORAGE

Inspect materials delivered to the site for damage; unload and store with a minimum of handling in accordance with recommendations contained in AAMA CW-10. Storage spaces shall be dry locations with adequate ventilation, free from heavy dust, not subject to combustion products or sources of water, and shall permit easy access for inspection and handling. Deliver calking and sealing compounds to the job site in sealed containers labeled to show the designated name, formula or specifications number; lot number; color; date of manufacturer; shelf life; and curing time when applicable.

### 1.8.1 Protective Covering

Prior to shipment from the factory, place knocked-down lineal members in cardboard containers and cover finished surfaces of aluminum with protective covering of adhesive paper, waterproof tape, or strippable plastic. Covering shall not chip, peel, or flake due to temperature or weather, shall protect against discoloration and surface damage from transportation, and storage, and shall be resistant to alkaline mortar and plaster. Do not cover aluminum surfaces that will be in contact with sealants after installation.

### 1.8.2 Identification

Prior to delivery, mark wall components to correspond with shop and erection drawings placement location and erection.

## 1.9 WARRANTY

Insulating glass units shall be guaranteed not to develop material obstruction of vision as a result of dust or film formation on the inner glass surface caused by failure of the seal, other than through glass breakage, within a period of 5 years from date of acceptance of work by the Government. Units failing to comply with the terms of this guarantee shall be replaced with new units without additional cost to the Government. The Contractor shall require the manufacturer to execute their warranties in writing directly to the Government.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Aluminum

Shall be free from defects impairing strength or durability of surface finish. Standard alloys shall conform to standards and designations of AA ASD1. Special alloys, not covered by the following ASTM specifications, shall conform to standards and designations recommended by the manufacturer for the purpose intended.

##### 2.1.1.1 Wrought Aluminum Alloys

Shall be those which include aluminum alloying elements not exceeding the following maximum limits when tested and additional in accordance with ASTM E 34. These limits apply to both bare products and the core of clad products. The cladding of clad products shall be within the same limits except that the maximum zinc limit may be 2.5 percent in order to assure that the cladding is anodic to the core. Special wrought alloys with a silicon content not more than 7.0 percent will be acceptable for limited structural uses where special appearance is required:

<u>ALLOY</u>	<u>PERCENT</u>
Silicon	1.5
Magnesium, Manganese, and Chromium combined	6.0
Iron	1.0

<u>ALLOY</u>	<u>PERCENT</u>
Copper	0.4
Zinc	1.0

Within the chemical composition limits set forth above, wrought aluminum alloys shall conform to the following:

- a. Extruded bars, rods, shapes and tubes: ASTM B 221.
- b. Sheet and Plate: ASTM B 209.

#### 2.1.1.2 Cast Aluminum Alloys

Provide those in which the alloying elements are silicon, magnesium, manganese, or a combination of these. Other elements shall not exceed the following limits:

<u>ELEMENT</u>	<u>PERCENT</u>
Iron	1.2
Copper	0.4
Nickel	0.4
Titanium	0.2
Others (total)	0.5

Within the chemical composition limits set forth above, cast aluminum alloys shall conform to the following:

- a. Sand castings: ASTM B 26/B 26M.
- b. Die casting: ASTM B 85.
- c. Permanent mold castings: ASTM B 108.

#### 2.1.1.3 Welding Rods and Electrodes

Welding rods and bare electrodes shall conform to AWS A5.10/A5.10M as recommended by the manufacturer of the aluminum base metal alloy being used.

#### 2.1.1.4 Finish

Clean exposed aluminum surfaces and provide an anodized finish conforming to AA DAF-45. Finish shall be clear (natural), designation AA-M10-C22-A41, Architectural Class I 0.7 mil or thicker.

#### 2.1.1.5 Strength

Aluminum extrusions for framing members used in curtain walls and main frame and sash or ventilator members in windows shall have a minimum ultimate tensile strength of 22,000 psi and a minimum yield strength of 16,000 psi.

### 2.1.2 Carbon Steel

Conform to the following specifications:

- a. Rolled shapes, plates, and bars: ASTM A 36/A 36M.
- b. Galvanized sheets: ASTM A 653/A 653M.
- c. Other sheets: ASTM A 570/A 570M or ASTM A 611.

### 2.1.3 High-Strength, Low-Alloy Steel

Conform to ASTM A 572/A 572M for structural shapes, plates, and bars.

### 2.1.4 Metal Fasteners

Provide fasteners as specified in paragraph entitled "Fastener Metals for Joining Various Metal Combinations" in "Part 2 - Products" of the AAMA MCWM-1. Metals used for fasteners shall be chemically and galvanically compatible with contiguous materials.

### 2.1.5 Joint Sealants and Accessories

Provide manufacturer's standard colors as closely matching the adjacent surfaces as possible.

#### 2.1.5.1 Elastomeric, Single or Multiple Component for Framing System

ASTM C 920, Type S, single component or Type M, multiple component. Use Grade NS, nonsag type in joints on vertical surfaces and use Grade P, self-leveling or flow type, in joints on horizontal surfaces.

#### 2.1.5.2 Single Component Silicone Rubber Base for Framing System

ASTM C 920, Type S, Grade NS (Silicone).

#### 2.1.5.3 Solvents and Primers

Provide material which is quick drying, colorless, nonstaining, compatible with compound used, as recommended by sealant manufacturer. Where primer is specified or recommended by sealant manufacturer, tests related to that material shall include primer.

#### 2.1.5.4 Backing Material

Provide material which is nonstaining, nonabsorbent, and compatible with sealing compound. Closed cell resilient urethane, polyvinylchloride or polyethylene foam; closed-cell sponge of vinyl or rubber; closed cell neoprene or butyl rod; or polychloroprene tubes or beads.

#### 2.1.5.5 Bond Preventive Materials

Provide polyethylene tape with pressure-sensitive adhesive; aluminum foil or waxed paper.

#### 2.1.5.6 Preformed Sealing Compound

Provide nonskinning type conforming to AAMA 800. Tapes, beads, ribbons or

other shapes as required.

#### 2.1.6 Glass and Glazing

Insulating glass unit materials are specified under Section 08800, GLAZING. Provide frame bite as specified.

##### 2.1.6.1 Glass Sizes and Clearances

Sizes indicated are nominal. Verify actual sizes required by measuring frames. Coordinate dimensions for glass and glass holding members to meet applicable minimum clearances as recommended by glass manufacturer. Do not nip to remove flares or to reduce oversized dimensions.

##### 2.1.6.2 Glass Setting Materials

- a. Visible sealants as specified above.
- b. Preformed compression gaskets and seals: ASTM C 864, color black.
- c. Preformed lock-strip type gaskets: ASTM C 542, factory formed, color black. Provide separate filler or locking strips, approximately 10 Shore "A" Durometer points harder than gasket body, and insure permanent and continuous pressure of sealing lips. Grooves and ends shall be square butted or mitered 45 degrees.
- d. Setting blocks, edge blocks, and spacer shims: Fabricate from neoprene or other materials recommended by glass manufacturer compatible with compounds, sealants, or gaskets used. Unless otherwise recommended by the glass manufacturer, shore "A" Durometer hardness for setting and edge blocks shall be 90 plus or minus 5; for spacer shims, 50 plus or minus 5.

##### 2.1.7 Metal Accessories

Flashings, Closures, and soffits accessories. Fabricate accessories of sizes and shapes indicated from similar materials and finish as specified for wall system.

##### 2.1.7.1 Aluminum Panels

Provide aluminum panels composed of same material and finish as glazed curtain wall system. Provide manufacturer's standard polyisocyanurate or expanded polystyrene insulation board with applied manufacturer's standard vapor barrier. Coordinate thickness of insulation with electrical contractor for clearance required for electrical conduits.

## PART 3 EXECUTION

### 3.1 FABRICATION

The curtain wall components shall be of the materials and thickness indicated or specified. The details indicated are representative of the required design and profiles. Acceptable designs may differ from that shown if the proposed system components conform to the limiting dimensions indicated and the requirements specified herein. Unless specifically indicated or specified otherwise, the methods of fabrication and assembly



shall be at the discretion of the curtain wall manufacturer. Perform fitting and assembling of components in the shop to the maximum extent practicable. Anchorage devices shall permit adjustment in three directions. Exposed fastenings used on finished surfaces shall be truss head, flat head, or oval head screws or bolts.

#### 3.1.1 Joints

Provide welded or mechanical fasteners as indicated or specified. Match joints in exposed work to produce continuity of line and design. Bed-joints or rabbets receiving calking or sealing material shall be minimum 3/4 inch deep and 3/8 inch wide at mid ambient temperature range.

#### 3.1.2 Welding

Conform to AWS D1.1/D1.1M. Use methods and electrodes recommended by manufacturers of base metal alloys. Welding rods shall be of an alloy that matches the color of the metal being welded. Protect glass and other finish from exposure to welding spatter. Ground and finish weld beads on exposed metal surfaces to minimize mismatch and to blend with finish on adjacent parent metal. If flux is used in welding aluminum, completely remove it immediately upon completion of welding operations. Do not use exposed welds on aluminum surfaces.

#### 3.1.3 Soldering and Brazing

Provide as recommended by suppliers. Solder only for filling or sealing joints.

#### 3.1.4 Ventilation and Drainage

Provide internal ventilation drainage system of weeps or based on principles of pressure equalization to ventilate the wall internally and to discharge condensation and water leakage to exterior as inconspicuously as possible. Flashings and other materials used internally shall be nonstaining, noncorrosive, and nonbleeding.

#### 3.1.5 Protection and Treatment of Metals

##### 3.1.5.1 General

Remove from metal surfaces lubricants used in fabrication and clean off other extraneous material before leaving the shop.

##### 3.1.5.2 Galvanic Action

Provide protection against galvanic action wherever dissimilar metals are in contact, except in the case of aluminum in permanent contact with galvanized steel, zinc, stainless steel, or relatively small areas of white bronze. Paint contact surfaces with one coat bituminous paint or apply appropriate calking material or nonabsorptive, noncorrosive, and nonstaining tape or gasket between contact surfaces.

##### 3.1.5.3 Protection for Aluminum

Protect aluminum which is placed in contact with, built into, or which will receive drainage from masonry, lime mortar, concrete, or plaster with one coat of alkali-resistant bituminous paint. Where aluminum is contacted by absorptive materials subject to repeated wetting or treated with

preservative noncompatible with aluminum, apply two coats of aluminum paint, to such materials and seal joints with approved calking compound.

### 3.2 INSTALLATION

Installation and erection of glazed wall system and all components shall be performed under direct supervision of and in accordance with approved recommendations and instructions of wall system manufacturer or fabricator.

#### 3.2.1 Bench Marks and Reference Points

Establish and permanently mark bench marks for elevations and building line offsets for alignment at convenient points on each floor level. Should any error or discrepancy be discovered in location of the marks, stop erection work in that area until discrepancies have been corrected.

#### 3.2.2 Verifying Conditions and Adjacent Surfaces

After establishment of lines and grades and prior to system installation examine supporting structural elements. Verify governing dimensions, including floor elevations, floor to floor heights, minimum clearances between curtain wall and structural frames, and other permissible dimensional tolerances in the building frame.

#### 3.2.3 Aluminum Panels

Install insulated aluminum panels in glazed curtain wall system with panel face flush with exterior face of glazing cap. Seal around perimeter of panel using same sealant used for glazing installation.

#### 3.2.4 Aluminum Doors and Frames

Install aluminum doors and frames as required in glazed curtain wall assembly to provide for weathertight and fully operable installation.

#### 3.2.5 Windows

##### 3.2.5.1 Sealing

Seal exterior metal to metal joints between members of frames, mullions, and mullion covers. Remove excess sealant.

#### 3.2.6 Joint Sealants

##### 3.2.6.1 Surface Preparation

Surfaces to be primed and sealed shall be clean, dry to the touch, free from frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter. Enclose joints on three sides. Clean out grooves to proper depth. Joint dimensions shall conform to approved detail drawings with a tolerance of plus 1/8 inch. Do not apply compound unless ambient temperature is between 40 and 90 degrees F. Clean out loose particles and mortar just before sealing. Remove protective coatings or coverings from surfaces in contact with sealants before applying sealants or tapes. Solvents used to remove coatings shall be of type that leave no residue on metals.

##### 3.2.6.2 Applications

Match approved sample. Force compound into grooves with sufficient

pressure to fill grooves solidly. Sealing compound shall be uniformly smooth and free of wrinkles and, unless indicated otherwise, shall be tooled and left sufficiently convex to result in a flush joint when dry. Do not trim edges of sealing material after joints are tooled. Mix only amount of multi-component sealant which can be installed within four hours, but at no time shall this amount exceed 5 gallons.

#### 3.2.6.3 Primer

Apply to masonry, concrete, wood, and other surfaces as recommended by sealant manufacturer. Do not apply primer to surfaces which will be exposed after calking is completed.

#### 3.2.6.4 Backing

Tightly pack in bottom of joints which are over 1/2 inch in depth with specified backing material to depth indicated or specified. Roll backing material of hose or rod stock into joints to prevent lengthwise stretching.

#### 3.2.6.5 Bond Prevention

Install bond preventive material at back or bottom of joint cavities in which no backstop material is required, covering full width and length of joint cavities.

#### 3.2.6.6 Protection and Cleaning

Remove compound smears from surfaces of materials adjacent to sealed joints as the work progresses. Use masking tape on each side of joint where texture of adjacent material will be difficult to clean. Remove masking tape immediately after filling joint. Scrape off fresh compound from adjacent surfaces immediately and rub clean with approved solvent. Upon completion of calking and sealing, remove remaining smears, stains, and other soiling, and leave the work in clean neat condition.

#### 3.2.7 Glass

Install in accordance with manufacturer's recommendations as modified herein.

##### 3.2.7.1 Inspection of Sash and Frames

Before installing glass, inspect sash and frames to receive glass for defects such as dimensional variations, glass clearances, open joints, or other conditions that will prevent satisfactory glass installation. Do not proceed with installation until defects have been corrected.

##### 3.2.7.2 Preparation of Glass and Rabbets

Clean sealing surfaces at perimeter of glass and sealing surfaces of rabbets and stop beads before applying glazing compound, sealing compound, glazing tape, or gaskets. Use only approved solvents and cleaning agents recommended by compound or gasket manufacturer.

##### 3.2.7.3 Positioning Glass

Set glass from inside the building unless otherwise indicated or specified. Maintain specified edge clearances and glass bite at perimeter. Maintain position of glass in rabbet and provide required sealant thickness on both

sides of glass. For glass dimensions larger than 50 united inches, provide setting blocks at sill and spacer shims on all four sides; locate setting blocks one quarter way in from each jamb edge of glass. Where setting blocks and spacer shims are set into glazing compound or sealant, butter with compound or sealant, place in position, and allow to firmly set prior to installation of glass.

#### 3.2.7.4 Setting Methods

Apply wet ASTM C 1184 compliant structural silicone sealant uniformly with accurately formed corners and bevels. Remove excess compound from glass and sash. Use only recommended thinners, cleaners, and solvents. Strip surplus compound from both sides of glass and tool at slight angle to shed water and provide clean sight lines. Secure stop beads in place with suitable fastenings. Do not apply compound or sealant at temperatures lower than 40 degrees F, or on damp, dirty, or dusty surfaces. After glazing, fix ventilators in sash so they cannot be operated until compound or sealant has set. Apply in compliancae with the requirements of ASTM C 1401.

#### 3.2.7.5 Void Space

Insulating glass, and glass of other types that exceed 100 united inches in size: Provide void space at head and jamb to allow glass to expand or move without exuding the sealant.

#### 3.2.7.6 Insulating Glass

Provide adequate means to weep incidental water and condensation away from the sealed edges of insulated glass units and out of the wall system. The weeping of lock-strip gaskets should be in accordance with the recommendation of the glass manufacturer.

#### 3.2.7.7 Insulating Glass With Edge Bands

Insulating glass with flared metal edge bands set in lock-strip type gaskets: Follow glass manufacturer's recommendations and add supplementary wet seal as required; when used with glazing tape, use tapered tape.

### 3.3 FINISHES

#### 3.3.1 Galvanizing for Non-Visible Components

Conform to ASTM A 123/A 123M, ASTM A 153/A 153M, and ASTM A 653/A 653M, as applicable.

##### 3.3.1.1 Anodic Coating for Visible Components

Clean exposed aluminum surfaces and provide finishing conforming to AA DAF-45. Finish shall be clear (natural), designation AA-M10-C22-A41, Architectural Class I 0.7 mil or thicker.

##### 3.3.1.2 Repair of Zinc-Coated Surfaces

Repair zinc coated surfaces damaged by welding or other means with galvanizing repair paint or by application of stick or thick paste material specifically designed for repair of galvanizing, as approved.

### 3.3.2 Cleaning

Clean steel and iron work by power wire brushing or other approved manual or mechanical means, for removal of rust, loose paint, scale, and deleterious substances. Wash cleaned surfaces which become contaminated with rust, dirt, oil, grease, or other foreign matter, with solvents until thoroughly clean. Cleaning steel embedded in concrete is not required.

### 3.4 FIELD TESTS

Conduct field check test for water leakage on designated wall areas after erection. Conduct test on two wall areas, two bays wide by two stories high where directed. Conduct test and take necessary remedial action as described in AAMA 501.

### 3.5 CLEANING AND PROTECTION

#### 3.5.1 Glass

Upon completion of wall system installation, thoroughly wash glass surfaces on both sides and remove labels, paint spots, compounds, and other defacements. Replace cracked, broken, and defective glass with new glass at no additional cost to the Government.

#### 3.5.2 Aluminum Surfaces

Protection methods, cleaning, and maintenance shall be in accordance with AAMA 609/610 and AAMA 609/610.

#### 3.5.3 Other Metal Surfaces

After installation, protect windows, and other exposed surfaces from disfiguration, contamination, contact with harmful materials, and from other construction hazards that will interfere with their operation, or damage their appearance or finish. Protection methods shall be in accordance with recommendations of product manufacturers or of the respective trade association. Remove paper or tape factory applied protection immediately after installation. Clean surfaces of mortar, plaster, paint, smears of sealants, and other foreign matter to present neat appearance and prevent fouling of operation. In addition, wash with a stiff fiber brush, soap and water, and thoroughly rinse. Where surfaces become stained or discolored, clean or restore finish in accordance with recommendations of product manufacturer or the respective trade association.

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## SECTION 09100N

## METAL SUPPORT ASSEMBLIES

09/99

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM A 463/A 463M	(2002a) Steel Sheet, Aluminum-Coated, by the Hot-Dip Process
ASTM A 653/A 653M	(2002a) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM C 645	(1998) Nonstructural Steel Framing Members
ASTM C 754	(1997) Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products

## 1.2 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

## SD-02 Shop Drawings

Metal support systems; G-AE

Submit for the erection of special metal framing, and ceiling suspension systems. Indicate materials, sizes, thicknesses, and fastenings.

## 1.3 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the job site and store in ventilated dry locations. Storage area shall permit easy access for inspection and handling. If materials are stored outdoors, stack materials off the ground, supported on a level platform, and fully protected from the weather. Handle materials carefully to prevent damage. Remove damaged items and provide new items.

## PART 2 PRODUCTS

## 2.1 MATERIALS

Provide steel materials for metal support systems with galvanized coating ASTM A 653/A 653M, G-60; aluminum coating ASTM A 463/A 463M, T1-25; or a 55-percent aluminum-zinc coating.



### 2.1.1 Materials for Attachment of Gypsum Wallboard

#### 2.1.1.1 Suspended and Furred Ceiling Systems

ASTM C 645.

#### 2.1.1.2 Nonload-Bearing Wall Framing and Furring

ASTM C 645, but not thinner than 0.0179 inch thickness, with 0.0329 inch minimum thickness supporting wall hung items such as cabinetwork, equipment and fixtures.

#### 2.1.1.3 Z-Furring Channels with Wall Insulation

Not lighter than 26 gage galvanized steel, Z-shaped, with 1 1/4 inch and 3/4 inch flanges and depth as required by the insulation thickness provided.

## PART 3 EXECUTION

### 3.1 INSTALLATION

#### 3.1.1 Systems for Attachment of Gypsum Wallboard

##### 3.1.1.1 Suspended and Furred Ceiling Systems

ASTM C 754, except that framing members shall be 16 inches o.c. unless indicated otherwise.

##### 3.1.1.2 Nonload-Bearing Wall Framing and Furring

ASTM C 754, except as indicated otherwise.

##### 3.1.1.3 Z-Furring Channels with Wall Insulation

Install Z-furring channels vertically spaced not more than 24 inches o.c. Locate Z-furring channels at interior and exterior corners in accordance with manufacturer's printed erection instructions. Fasten furring channels to masonry walls with powder-driven fasteners or hardened concrete steel nails through narrow flange of channel. Space fasteners not more than 24 inches o.c.

### 3.2 ERECTION TOLERANCES

Framing members which will be covered by finish materials such as wallboard shall be within the following limits:

- a. Layout of walls and partitions: 1/4 inch from intended position;
- b. Plates and runners: 1/4 inch in 8 feet from a straight line;
- c. Studs: 1/4 inch in 8 feet out of plumb, not cumulative; and
- d. Face of framing members: 1/4 inch in 8 feet from a true plane.

Framing members which will be covered by ceramic tile set in dry-set mortar, latex-portland cement mortar, or organic adhesive shall be within the following limits:

- a. Layout of walls and partitions: 1/4 inch from intended position;
- b. Plates and runners: 1/8 inch in 8 feet from a straight line;
- c. Studs: 1/8 inch in 8 feet out of plumb, not cumulative; and
- d. Face of framing members: 1/8 inch in 8 feet from a true plane.

### 3.3 ACOUSTIC SEALANT INSTALLATION

Install beneath all interior STC acoustically rated stud wall sills tracks.  
Install using 3 continuous beads under stud wall sill track.

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## SECTION 09250

## GYPSUM BOARD

**11/01**

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- |              |  |
|--------------|--|
| ANSI A108.11 | (1992) Interior Installation of<br>Cementitious Backer Units                                 |
| ANSI A108.1  | (1999) Installation of Ceramic Tile;<br>including A108.1A-C, 108.4-.13, 118.1-.10,<br>A136.1 |

## ASTM INTERNATIONAL (ASTM)

- |                     |  |
|---------------------|--|
| ASTM C 36/C 36M     | (2001) Gypsum Wallboard  |
| ASTM C 442/C 442M   | (1999; Rev. A) Gypsum Backing Board and<br>Coreboard   |
| ASTM C 475          | (1994) Joint Compound and Joint Tape for<br>Finishing Gypsum Board   |
| ASTM C 630/C 630M   | (2001) Water-Resistant Gypsum Backing Board  |
| ASTM C 840          | (2001) Application and Finishing of Gypsum<br>Board  |
| ASTM C 954          | (2000) Steel Drill Screws for the<br>Application of Gypsum Board or Metal<br>Plaster Bases to Steel Studs from 0.033<br>in. (0.84 mm) to 0.112 in. (2.84 mm) in<br>Thickness |
| ASTM C 1002         | (2000) Steel Drill Screws for the<br>Application of Gypsum Panel Products or<br>Metal Plaster Bases  |
| ASTM C 1047         | (1999) Accessories for Gypsum Wallboard<br>and Gypsum Veneer Base  |
| ASTM C 1396/C 1396M | (2000) Standard Specification for Gypsum<br>Board  |
| ASTM D 226          | (1997a) Asphalt-Saturated Organic Felt<br>Used in Roofing and Waterproofing  |

## GYPSUM ASSOCIATION (GA)

- GA 214 (1996) Recommended Levels of Gypsum Board Finish
- GA 216 (2000) Application and Finishing of Gypsum Board

## UNDERWRITERS LABORATORIES (UL)

- UL Fire Resist Dir (2003) Fire Resistance Directory (Vol 1, 2A, 2B & 3)

## 1.2 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

## SD-03 Product Data

Cementitious backer units

Water-Resistant Gypsum Backing Board

Accessories

Submit for each type of gypsum board and for cementitious backer units.

## SD-07 Certificates

Asbestos Free Materials; G-AO

Certify that gypsum board types, gypsum backing board types, cementitious backer units, and joint treating materials do not contain asbestos.

## 1.3 DELIVERY, STORAGE, AND HANDLING

## 1.3.1 Delivery

Deliver materials in the original packages, containers, or bundles with each bearing the brand name, applicable standard designation, and name of manufacturer, or supplier.

## 1.3.2 Storage

Keep materials dry by storing inside a sheltered building. Where necessary to store gypsum board and cementitious backer units outside, store off the ground, properly supported on a level platform, and protected from direct exposure to rain, snow, sunlight, and other extreme weather conditions. Provide adequate ventilation to prevent condensation.

## 1.3.3 Handling

Neatly stack gypsum board and cementitious backer units flat to prevent sagging or damage to the edges, ends, and surfaces.

#### 1.4 ENVIRONMENTAL CONDITIONS

##### 1.4.1 Temperature

Maintain a uniform temperature of not less than 50 degrees F in the structure for at least 48 hours prior to, during, and following the application of gypsum board, cementitious backer units, and joint treatment materials, or the bonding of adhesives.

##### 1.4.2 Exposure to Weather

Protect gypsum board and cementitious backer unit products from direct exposure to rain, snow, sunlight, and other extreme weather conditions.

#### 1.5 QUALIFICATIONS

Manufacturer shall specialize in manufacturing the types of material specified and shall have a minimum of 5 years of documented successful experience. Installer shall specialize in the type of gypsum board work required and shall have a minimum of 3 years of documented successful experience.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

Conform to specifications, standards and requirements specified herein. Provide gypsum board types, gypsum backing board types, cementitious backing units, and joint treating materials manufactured from asbestos free materials only.

##### 2.1.1 Gypsum Board

ASTM C 36/C 36M and ASTM C 1396/C 1396M.

###### 2.1.1.1 Regular

48 inches wide, 5/8 inch thick, tapered unless noted otherwise.

###### 2.1.1.2 Type X (Special Fire-Resistant)

48 inches wide, 5/8 inch thick, tapered edges.

##### 2.1.2 Regular Water-Resistant Gypsum Backing Board

ASTM C 630/C 630M

###### 2.1.2.1 Regular

48 inches wide, 5/8 inch thick, tapered edges.

###### 2.1.2.2 Type X (Special Fire-Resistant)

48 inches wide, 5/8 inch thick, tapered edges.

##### 2.1.3 Cementitious Backer Units

ANSI A108.1.

#### 2.1.4 Joint Treatment Materials

ASTM C 475.

##### 2.1.4.1 Embedding Compound

Specifically formulated and manufactured for use in embedding tape at gypsum board joints and compatible with tape, substrate and fasteners.

##### 2.1.4.2 Finishing or Topping Compound

Specifically formulated and manufactured for use as a finishing compound.

##### 2.1.4.3 All-Purpose Compound

Specifically formulated and manufactured to serve as both a taping and a finishing compound and compatible with tape, substrate and fasteners.

##### 2.1.4.4 Setting or Hardening Type Compound

Specifically formulated and manufactured for use with fiber glass mesh tape.

##### 2.1.4.5 Joint Tape

Cross-laminated, tapered edge, reinforced paper, or fiber glass mesh tape recommended by the manufacturer.

#### 2.1.5 Fasteners

##### 2.1.5.1 Screws

ASTM C 1002, Type "G", Type "S" or Type "W" steel drill screws for fastening gypsum board to gypsum board, wood framing members and steel framing members less than 0.033 inch thick. ASTM C 954 steel drill screws for fastening gypsum board to steel framing members 0.033 to 0.112 inch thick. Provide cementitious backer unit screws with a polymer coating.

#### 2.1.6 Adhesives

Do not use adhesive containing benzene, carbon tetrachloride, or trichloroethylene.

##### 2.1.6.1 Adhesive for Fastening Gypsum Board to Metal Framing

Type recommended by gypsum board manufacturer.

##### 2.1.7 Shaftwall Liner Panel

ASTM C 442/C 442M. Shaftwall liner panel shall conform to UL Fire Resist Dir for the Design Number(s) indicated. Liner Panel shall be specifically manufactured for cavity shaftwall system, with water-resistant paper faces, bevel edges, single lengths to fit required conditions, 1" thick, by 24" wide.

#### 2.1.8 Accessories

ASTM C 1047. Fabricate from corrosion protected steel or plastic designed for intended use. Accessories manufactured with paper flanges are not acceptable. Flanges shall be free of dirt, grease, and other materials



that may adversely affect bond of joint treatment. Provide prefinished or job decorated materials.

#### 2.1.9 Asphalt Impregnated Building Felt

The moisture barrier over gypsum sheathing shall be 15-lb asphalt impregnated felt conforming to ASTM D 226 Type I (No. 15).

#### 2.1.10 Water

Clean, fresh, and potable.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

##### 3.1.1 Framing and Furring

Verify that framing and furring are securely attached and of sizes and spacing to provide a suitable substrate to receive gypsum board and cementitious backer units. Verify that all blocking, headers and supports are in place to support plumbing fixtures and to receive soap dishes, grab bars, towel racks, and similar items. Do not proceed with work until framing and furring are acceptable for application of gypsum board and cementitious backer units.

##### 3.1.2 Gypsum Board and Framing

Verify that surfaces of gypsum board and framing to be bonded with an adhesive are free of dust, dirt, grease, and any other foreign matter. Do not proceed with work until surfaces are acceptable for application of gypsum board with adhesive.

#### 3.2 APPLICATION OF GYPSUM BOARD

Apply gypsum board to framing and furring members in accordance with ASTM C 840 or GA 216 and the requirements specified herein. Apply gypsum board with separate panels in moderate contact; do not force in place. Stagger end joints of adjoining panels. Neatly fit abutting end and edge joints. Use gypsum board of maximum practical length. Cut out gypsum board as required to make neat close joints around openings. In vertical application of gypsum board, provide panels in lengths required to reach full height of vertical surfaces in one continuous piece. Surfaces of gypsum board and substrate members may be bonded together with an adhesive, except where prohibited by fire rating(s). Treat edges of cutouts for plumbing pipes, screwheads, and joints with water-resistant compound as recommended by the gypsum board manufacturer. Provide type of gypsum board for use in each system specified herein as indicated.

##### 3.2.1 Application of Gypsum Board to Steel Framing and Furring

Apply in accordance with ASTM C 840, System VIII or GA 216.

##### 3.2.2 Control Joints

Install expansion and contraction joints in ceilings and walls in accordance with ASTM C 840, System XIII or GA 216, unless indicated otherwise. Control joints between studs in fire-rated construction shall be filled with firesafing insulation to match the fire-rating of

construction.

### 3.3 APPLICATION OF CEMENTITIOUS BACKER UNITS

#### 3.3.1 Application

In wet areas (shower enclosures), apply cementitious backer units in accordance with ANSI A108.11. A 15 lb asphalt impregnated, continuous felt paper membrane shall be placed behind cementitious backer units, between backer units and studs or base layer of gypsum board. Membrane shall be placed with a minimum 6 inch overlap of sheets laid shingle style.

#### 3.3.2 Joint Treatment

ANSI A108.11.

### 3.4 FINISHING OF GYPSUM BOARD

Tape and finish gypsum board in accordance with ASTM C 840, GA 214 and GA 216. Plenum areas above ceilings shall be finished to Level 1 in accordance with GA 214. Water resistant gypsum backing board, ASTM C 630/C 630M, to receive ceramic tile shall be finished to Level 2 in accordance with GA 214. Unless otherwise specified, all gypsum board walls, partitions and ceilings shall be finished to Level 5 in accordance with GA 214. Provide joint, fastener depression, and corner treatment. Do not use fiber glass mesh tape with conventional drying type joint compounds; use setting or hardening type compounds only. Provide treatment for water-resistant gypsum board as recommended by the gypsum board manufacturer.

### 3.5 SEALING

Seal openings around pipes, fixtures, and other items projecting through gypsum board and cementitious backer units as specified in Section 07920 "Joint Sealants." Apply material with exposed surface flush with gypsum board or cementitious backer units.

### 3.6 FIRE-RESISTANT ASSEMBLIES

Wherever fire-rated construction is indicated, provide materials and application methods, including types and spacing of fasteners, wall and ceiling framing in accordance with the specifications contained in UL Fire Resist Dir for the Design Number(s) indicated. Joints of fire-rated gypsum board enclosures shall be closed and sealed in accordance with UL test requirements or GA requirements. Penetrations through rated partitions and ceilings shall be sealed tight in accordance with tested systems. Fire ratings shall be as indicated.

### 3.7 PATCHING

Patch surface defects in gypsum board to a smooth, uniform appearance, ready to receive finish as specified.

### 3.8 SHAFT WALL FRAMING

The shaft wall system shall be installed in accordance with the system manufacturer's published instructions. Bucks, anchors, blocking and other items placed in or behind shaft wall framing shall be coordinated with electrical and mechanical work. Fireproofing materials which are damaged

or removed during shaft wall construction shall be patched or replaced.

-- End of Section --

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## SECTION 09310

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## SECTION 09310

## CERAMIC TILE

8/02

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A108.1A	(1992) Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar
ANSI A108.1B	(1992) Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar
ANSI A108.5	(1992) Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar
ANSI A108.10	(1992) Installation of Grout in Tilework
ANSI A118.4	(1992) Latex-Portland Cement Mortar
ANSI A118.6	(1992) Ceramic Tile Grouts
ANSI A118.9	(1992) Test Methods and Specifications for Cementitious Backer Units
ANSI A137.1	(1988) Ceramic Tile

## ASTM INTERNATIONAL (ASTM)

ASTM A 185	(2001) Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM C 33	(2002a) Concrete Aggregates
ASTM C 144	(2002) Aggregate for Masonry Mortar
ASTM C 150	(2002a) Portland Cement
ASTM C 206	(1984; R 1997) Finishing Hydrated Lime
ASTM C 207	(1991; R 1997) Hydrated Lime for Masonry Purposes
ASTM C 373	(1988; R 1999) Water Absorption, Bulk Density, Apparent Porosity, and Apparent

Specific Gravity of Fired Whiteware  
Products

ASTM C 482	(2002) Bond Strength of Ceramic Tile to Portland Cement
ASTM C 501	(1984; R 2002) Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser
ASTM C 648	(1998) Breaking Strength of Ceramic Tile
ASTM C 847	(1995; R 2000) Metal Lath
ASTM C 1027	(1999) Determining Visible Abrasion Resistance of Glazed Ceramic Tile
ASTM C 1028	(1996) Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method

TILE COUNCIL OF AMERICA (TCA)

TCA Hdbk	(1997) Handbook for Ceramic Tile Installation
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U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities
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## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-03 Product Data

Tile; G-AE  
Setting-Bed; G-AE  
Mortar, Grout, and Adhesive; G-AE

Manufacturer's catalog data and preprinted installation and cleaning instructions.

### SD-04 Samples

Tile; G-AE  
Accessories; G-AE  
Solid Polymer (Solid Surfacing) Thresholds; G-AE

Samples of sufficient size to show color range, pattern, type and joints.



## SD-07 Certificates

Tile  
Mortar, Grout, and Adhesive

Certificates indicating conformance with specified requirements.  
A master grade certificate shall be furnished for tile.

## 1.3 DELIVERY AND STORAGE

Materials shall be delivered to the project site in manufacturer's original unopened containers with seals unbroken and labels and hallmarks intact. Materials shall be kept dry, protected from weather, and stored under cover in accordance with manufacturer's instructions.

## 1.4 ENVIRONMENTAL REQUIREMENTS

Ceramic tile work shall not be performed unless the substrate and ambient temperature is at least 50 degrees F and rising. Temperature shall be maintained above 50 degrees F while the work is being performed and for at least 7 days after completion of the work. When temporary heaters are used they shall be vented to the outside to avoid carbon dioxide damage to new tilework.

## 1.5 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a 1-year period shall be provided.

## 1.6 EXTRA STOCK

Supply an extra two percent of each type tile used in clean and marked cartons.

## PART 2 PRODUCTS

## 2.1 TILE

Tile shall be standard grade conforming to ANSI A137.1. Containers shall be grade sealed. Seals shall be marked to correspond with the marks on the signed master grade certificate. Tile shall be impact resistant with a minimum breaking strength for wall tile of 90 lbs and 250 lbs for floor tile in accordance with ASTM C 648. Water absorption shall be 0.50 maximum percent in accordance with ASTM C 373. Floor tile shall have a minimum coefficient of friction of 0.60 wet and dry in accordance with ASTM C 1028. Floor tile shall be Class III-Medium Heavy Traffic, durability classification as rated by the manufacturer when tested in accordance with ASTM C 1027 for abrasion resistance as related to foot traffic. Color and size shall be in accordance with Section 09915 COLOR SCHEDULE.

## 2.1.1 Mosaic Tile

Ceramic mosaic tile and trim shall be unglazed porcelain unpolished with sharply formed face. Tile size shall be 2 x 2 inches. Color shall be in accordance with Section 09915 COLOR SCHEDULE.

### 2.1.2 Porcelain Tile

Porcelain tile and trim shall be unglazed with the color extending uniformly through the body of the tile. Tile shall meet or exceed the following criteria: Abrasive wear in accordance with ASTM C 501 and bonding strength in accordance with ASTM C 482. Tile shall comply with 36 CFR 1191 for coefficient of friction for interior floors. Color and size shall be in accordance with Section 09915 COLOR SCHEDULE.

### 2.1.3 Glazed Wall Tile

Glazed wall tile and trim shall be cushion edged with brightglaze. Tile shall be 4-1/4 x 4-1/4 inches. Color shall be in accordance with Section 09915 COLOR SCHEDULE.

### 2.1.4 Accessories

Tile accessories shall consist of clear satin anodized aluminum edge protection extrusion and shapes. Provide manufacturers standard inside, outside and termination profiles in thickness to match tile.

## 2.2 SETTING-BED

The setting-bed shall be composed of the following:

### 2.2.1 Aggregate for Concrete Fill

Aggregate shall conform to ASTM C 33. Maximum size of coarse aggregate shall not be greater than one-half the thickness of concrete fill.

### 2.2.2 Portland Cement

Cement shall conform to ASTM C 150, Type I, white for wall mortar and gray for other uses.

### 2.2.3 Sand

Sand shall conform to ASTM C 144.

### 2.2.4 Hydrated Lime

Hydrated lime shall conform to ASTM C 206, Type S or ASTM C 207, Type S.

### 2.2.5 Metal Lath

Metal lath shall be flat expanded type conforming to ASTM C 847, and weighing not less than 2.5 pounds per square yard.

### 2.2.6 Reinforcing Wire Fabric

Wire fabric shall conform to ASTM A 185. Wire shall be either 2 x 2 inch mesh, 16/16 wire or 1-1/2 x 2 inch mesh, 16/13 wire.

## 2.3 WATER

Water shall be potable.

## 2.4 MORTAR, GROUT, AND ADHESIVE

Mortar, grout, and adhesive shall conform to the following:

### 2.4.1 Latex-Portland Cement Mortar

ANSI A118.4.

### 2.4.2 Ceramic Tile Grout

ANSI A118.6; latex-portland cement grout.

### 2.4.3 Cementitious Backer Board

Cementitious backer units shall be in accordance with ANSI A118.9.  
Cementitious backer units shall be 1/2 inch thick.

## 2.5 SOLID POLYMER (SOLID SURFACING) THRESHOLDS

Cast, 100 percent acrylic solid polymer (solid surfacing) thresholds shall be 4 inches wide by 3/8 inch thick by width of opening, beveled 2 inches minimum. Colors and patterns for solid polymer (solid surfacing) thresholds shall be as specified in Section 09915 COLOR SCHEDULE.

## PART 3 EXECUTION

### 3.1 PREPARATORY WORK AND WORKMANSHIP

Surface to receive tile shall be inspected and shall conform to the requirements of ANSI A108.1A or ANSI A108.1B for surface conditions for the type setting bed specified and for workmanship. Variations of surface to be tiled shall fall within maximum values shown below:

TYPE	WALLS	FLOORS
Latex portland cement mortar	1/8 inch in 8 ft.	1/8 inch in 10 ft.

### 3.2 GENERAL INSTALLATION REQUIREMENTS

Tile work shall not be started until roughing in for mechanical and electrical work has been completed and tested, and built-in items requiring membrane waterproofing have been installed and tested. Floor tile installation shall not be started in spaces requiring wall tile until after wall tile has been installed. Tile in colors and patterns indicated shall be applied in the area shown on the drawings. Tile shall be installed with the respective surfaces in true even planes to the elevations and grades shown. Special shapes shall be provided as required for sills, jambs, recesses, offsets, external corners, and other conditions to provide a complete and neatly finished installation. Tile bases and coves shall be solidly backed with mortar.

### 3.3 INSTALLATION OF WALL TILE

Wall tile shall be installed in accordance with the TCA Hdbk, method W 242-03 for non-wet areas. For wet areas use method W 244-03.

### 3.3.1 Workable or Cured Mortar Bed

Tile shall be installed over a workable mortar bed or a cured mortar bed at the option of the Contractor. A 4 mil polyethylene membrane, metal lath, and scratch coat shall also be installed. Workable mortar bed, materials, and installation of tile shall conform to ANSI A108.1A. Cured mortar bed and materials shall conform to ANSI A108.1B.

### 3.3.2 Latex-Portland Cement Mortar

Latex-portland cement shall be used to install tile in accordance with ANSI A108.5. Latex portland cement shall be used when installing porcelain ceramic tile.

## 3.4 INSTALLATION OF FLOOR TILE

Floor tile in all areas scheduled to receive tile but not in shower and drying areas, shall be installed in accordance with TCA Hdbk, method F113-03. In shower and drying areas, receptors shall be installed in accordance with TCA Hdbk, method B415-03.

### 3.4.1 Workable or Cured Mortar Bed

Floor tile shall be installed over a workable mortar bed or a cured mortar bed at the option of the Contractor. Workable mortar bed materials and installation shall conform to ANSI A108.1A. Cured mortar bed and materials shall conform to ANSI A108.1B.

### 3.4.2 Latex-Portland Cement

Latex-portland cement mortar shall be used to install tile directly over properly cured, plane, clean concrete slabs in accordance with ANSI A108.5. Latex portland cement shall be used when installing porcelain ceramic tile.

### 3.4.3 Ceramic Tile Grout

Ceramic Tile grout shall be prepared and installed in accordance with ANSI A108.10.

### 3.4.4 Waterproofing

Waterproofing under concrete fill shall conform to the requirements of Section 07131 ELASTOMERIC WATERPROOFING.

### 3.4.5 Concrete Fill

Concrete fill shall be 3500 psi concrete, mixed to as dry a consistency as practicable. The fill shall be spread, tamped, and screeded to a true plane, and pitched to drains or leveled as shown. Concrete fill shall be thoroughly damp cured before application of setting-bed material. Concrete fill shall be reinforced with one layer of reinforcement, with the uncut edges lapped the width of one mesh and the cut ends and edges lapped not less than 2 inches. Laps shall be tied together with 18 gauge wire every 10 inches along the finished edges and every 6 inches along the cut ends and edges. The reinforcement shall be supported and secured in the centers of concrete fills. The mesh shall be continuous; except where expansion joints occur, mesh shall be cut and discontinued across such joints. Reinforced concrete fill shall be provided under the setting-bed where the distance between the under-floor surface and the finished tile

floor surface is 2 inches or greater, and shall be of such thickness that the mortar setting-bed over the concrete fill shall be not less nor more than the thickness required in the specified TCA Hdbk methods.

### 3.5 INSTALLATION OF SOLID POLYMER (SOLID SURFACING) THRESHOLDS

Thresholds shall be installed where indicated in a manner similar to that of the ceramic tile floor. Thresholds shall be the full width of the opening. Thresholds shall allow for minimal sealant joints at jambs.

### 3.6 CLEANING AND PROTECTING

Upon completion, tile surfaces shall be thoroughly cleaned in accordance with manufacturer's approved cleaning instructions. Acid shall not be used for cleaning glazed tile. Floor tile with resinous grout or with factory mixed grout shall be cleaned in accordance with instructions of the grout manufacturer. After the grout has set, tile wall surfaces shall be given a protective coat of a noncorrosive soap or other approved method of protection. Tiled floor areas shall be covered with building paper before foot traffic is permitted over the finished tile floors. Board walkways shall be laid on tiled floors that are to be continuously used as passageways by workmen. Damaged or defective tiles shall be replaced.

-- End of Section --

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## SECTION 09410

PORTLAND CEMENT TERRAZZO  
11/03

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A108.1 (1999) Installation of Ceramic Tile;  
including A108.1A-C, 108.4-.13, 118.1-.10,  
A136.1

## ASTM INTERNATIONAL (ASTM)

ASTM C 33 (2002a) Concrete Aggregates

ASTM C 150 (2002a) Portland Cement

ASTM C 241 (1990; R 1997e1) Abrasion Resistance of  
Stone Subjected to Foot Traffic

## NATIONAL TERRAZZO &amp; MOSAIC ASSOCIATION (NTMA)

NTMA Info Guide (2000) Terrazzo Information Guide

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-02 Shop Drawings

Installation; G-AE

Drawings indicating the type, size, and layout of precast terrazzo items. Details shall show reinforcing.

## SD-03 Product Data

Manufactured Units; G-AE  
Mortar; G-AE

## SD-04 Samples

Manufactured Units; G-AE



Colorants; G-AE

Three 6 x 6 inch (minimum) samples of each color of terrazzo .

SD-07 Certificates

Manufacturer

Qualifications of Manufacturer

SD-10 Operation and Maintenance Data

Cleaning and Sealing; G-AO

Maintenance instructions for precast terrazzo.

### 1.3 GENERAL REQUIREMENTS

The contractor shall furnish precast terrazzo treads and risers and stair landings. Precast terrazzo shall be a product of a manufacturer who has been in the practice of manufacturing similar items for a period of not less than 5 years.

### 1.4 DELIVERY AND STORAGE

Materials shall be delivered in the manufacturer's unopened containers marked with manufacturer identification including size and piece number. Materials shall be delivered, handled, and stored under cover in accordance with manufacturers instructions in a manner that will prevent deterioration and contamination.

### 1.5 ENVIRONMENTAL REQUIREMENTS

Areas to receive precast terrazzo shall be maintained at a temperature above 60 degrees F 24 hours prior to the time units are placed and until completely cured.

### 1.6 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one-year period shall be provided.

## PART 2 PRODUCTS

### 2.1 PORTLAND CEMENT

Portland cement shall conform to ASTM C 150, Type I, of colors required to match color indicated in Section 09915 COLOR SCHEDULE.

### 2.2 SAND

Sand shall conform to ASTM C 33 for fine aggregate.

### 2.3 MARBLE CHIPS

Marble chips shall be of domestic origin of sizes and colors required to match color indicated in Section 09915 COLOR SCHEDULE. Marble chips shall have an abrasive hardness of not less than 10 when tested in accordance

with ASTM C 241; shall contain no deleterious or foreign matter; and the dust content shall be less than one percent by weight.

## 2.4 COLORANTS

Colorants shall be alkali-resistant and nonfading. Pigments shall be of colors required to match color indicated in Section 09915 COLOR SCHEDULE.

## 2.5 REINFORCEMENT HARDWARE

Reinforce precast with deformed rods or wire mesh or both as recommended by precast terrazzo manufacturer. Provide in accordance with NTMA Info Guide.

## 2.6 ABRASIVE INSERTS

Consisting of silicon carbide and black epoxy. Provide three 1/2 inch wide strips at each tread, the first set 1 inch from the nosing, then with 1/2 inch spaces between strips.

## 2.7 MORTAR

Mortar shall conform to the following:

### 2.7.1 Latex-Portland Cement Mortar

ANSI A108.1.

## 2.8 FLEXIBLE EPOXY

Flexible epoxy material shall be as recommended by precast terrazzo manufacturer. Match color of precast matrix.

## 2.9 TERRAZZO CLEANER

Terrazzo cleaner shall be biodegradable, phosphate free and shall have a pH factor between 7 and 8 and be of a type specially prepared for use on terrazzo, of formulation recommended by sealer manufacturer for type of precast terrazzo used.

## 2.10 SEALER

Sealer shall have a pH factor between 7 and 8 and be a penetrating type specially prepared for use on terrazzo. The sealer shall not discolor or amber the terrazzo and shall produce a slip resistant surface. Flash point of sealer shall be in accordance with NTMA Info Guide. Provide thin-coat, medium gloss water based sealer and finish system approved by precast terrazzo manufacturer.

## 2.11 MANUFACTURED UNITS

Finished surfaces shall be ground and polished, free of holes, with overall uniformity in matrix and aggregate. Exposed edges shall be ground and polished with a minimum of 1/16 inch bevel. Manufactured units shall have a minimum compressive strength of 4,000 psi and a minimum flexural strength of 600 psi. The honed surface of finished terrazzo shall show not less than 70 percent of the area as exposed aggregate evenly distributed, and shall conform in appearance to the approved samples. Thickness of units shall be as indicated on drawings. Units shall conform to size to similar and adjacent units with a 1/16 inch tolerance in each dimension. Seal

finished surfaces to manufacturer's standard but with a minimum two coats of sealer.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

##### 3.1.1 Preparation

Surfaces of metal stair substrate shall be cleaned and free of dust, dirt, grease and any other foreign matter.

##### 3.1.2 Placing Precast Terrazzo

Set precast accurately as shown on approved shop drawings, straight and true to all dimensions. Latex-portland cement mortar shall be used to install precast over properly prepared metal pan. Mortar shall be a minimum thickness of 1/8 inch and a maximum thickness of 3/8 inch. Fill joints between units with flexible epoxy material.

#### 3.2 CLEANING AND SEALING

The terrazzo shall be washed with a neutral cleaner and where required shall be cleaned with a fine abrasive to remove stains or cement smears. The cleaned surfaces shall be rinsed. When dry, a terrazzo sealer shall be applied in accordance with the manufacturer's directions.

#### 3.3 PROTECTION

The terrazzo work shall be covered and protected from damage until completion of the work of all other trades.

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## SECTION 09445A

## RESINOUS TERRAZZO FLOORING

01/04

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM D 2370 (1998; R 2002) Tensile Properties of Organic Coatings

ASTM D 56 (2002) Flash Point by Tag Closed Tester

## NATIONAL TERRAZZO &amp; MOSAIC ASSOCIATION (NTMA)

NTMA Info Guide (2000) Terrazzo Information Guide

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-02 Shop Drawings

Approved Detail Drawings; G-AE  
Strips; G-AE  
Control Joint Strips; G-AE

Drawings indicating the type, size, and layout of divider strips and control joint strips.

## SD-03 Product Data

Resin  
Flexible Epoxy Membrane  
Mixing, Proportioning, and Installation  
Cleaning and Sealing

Resin manufacturer's descriptive data including flexible epoxy membrane; mixing, proportioning, and installation instructions. Maintenance literature for terrazzo cleaning and sealing shall be included.

## SD-04 Samples

Resinous Terrazzo Flooring

Two 6 x 6 inches, (minimum) samples of each color of resinous terrazzo and two 6 inches lengths, of each type of strip. Label each terrazzo sample to identify manufacturer's matrix color and aggregate types, sizes and proportions.

#### SD-07 Certificates

##### Applicator

##### Qualification of Applicator

### 1.3 GENERAL REQUIREMENTS

Resinous terrazzo flooring, in the colors indicated, shall be applied in the areas shown on the approved detail drawings. Flooring shall be an epoxy terrazzo system that conforms to the requirements specified in paragraphs 2.01A and B of NTMA Info Guide.

### 1.4 QUALIFICATION OF APPLICATOR

Applicator shall be approved by the resin manufacturer and shall have a minimum of 3 years experience in the application of the materials to be used and shall have completed 8 successful installations within the past 2 years.

### 1.5 DELIVERY AND STORAGE

Materials shall be delivered to the project site in manufacturer's original unopened containers. Materials shall be kept in a clean, dry, area with temperatures controlled between 50 to 90 degrees F.

### 1.6 ENVIRONMENTAL REQUIREMENTS

Areas to receive terrazzo shall be maintained at a temperature above 50 degrees F for 2 days prior to installation and for 7 days following installation.

## PART 2 PRODUCTS

### 2.1 PRIMER

Primer shall be a material recommended by the resin manufacturer which will penetrate the pores of the substrate and bond with the topping to form a permanent monolithic bond between the substrate and the topping.

### 2.2 RESIN

Resin for the specified terrazzo flooring shall conform to the requirements shown in NTMA Info Guide.

### 2.3 FILLERS

Fillers, if required, shall be inert mineral or cellulosic material as recommended by the manufacturer and best suited for the resin binder used. Fillers shall be furnished in the quantity necessary to impart the required color and physical characteristics.

## 2.4 MARBLE CHIPS

Marble chips shall be of domestic origin of sizes and colors to match color indicated in Section 09915 COLOR SCHEDULE. Chips shall be a range of sizes up to and including the NTMA Standard No. 0 through Standard No. 2 for 3/8 inch thick floors.

## 2.5 FLEXIBLE EPOXY MEMBRANE

Flexible epoxy membrane shall be material recommended by the resin manufacturer with 100% solids with the following properties:

Tensile, Strength: ASTM D 2370, 68 degrees F (20 degrees C), 1,500 psi (10.3 Mpa)

Elongation: ASTM D 2370, 68 degrees F (20 degrees C), 130%

## 2.6 STRIPS

### 2.6.1 Divider Strips

Divider strips shall be as deep as required, 1/8 inch heavy top and of zinc in Section 09915 COLOR SCHEDULE.

### 2.6.2 Control Joint Strips

Control joint strips shall be as deep as required, 1/8 inch heavy top and of zinc. Flexible epoxy filler shall be thickness indicated on the drawings and color to match epoxy matrix.

## 2.7 GROUT

Grout shall be as recommended by the manufacturer of the resin.

## 2.8 SEALER

Sealer shall have a pH factor between 7 and 10 and shall be a penetrating type specially prepared for use on terrazzo. The sealer shall not discolor or amber the terrazzo and shall produce a slip resistant surface. Flash point of sealer shall be a minimum of 80 degrees F when tested in accordance with ASTM D 56.

# PART 3 EXECUTION

## 3.1 PREPARATION OF CONCRETE SUBFLOOR

Installation of the floor topping shall not commence until the concrete substrate is at least 28 days old. The concrete surfaces shall be prepared in accordance with the instructions of the resin manufacturer.

## 3.2 FLEXIBLE REINFORCING MEMBRANE

Prepare and prefill substrate cracks with epoxy primer recommended by epoxy terrazzo manufacturer and allow to cure. Install membrane at 25 mils, unless recommended otherwise by manufacturer, over prepared substrate to produce full substrate coverage in areas to receive terrazzo. Install second coat of membrane at 15 mils unless recommended otherwise by manufacturer and reinforce with fabric. Prepare membrane according to manufacturer's written instructions before applying primer. Install primer if required by manufacturer over membrane.



### 3.3 MIXING, PROPORTIONING, AND INSTALLATION

Mixing, proportioning, and installing shall be in accordance with the approved instructions of the manufacturer. Strips shall be installed in locations indicated. The topping shall be applied to give a finish thickness of 3/8 inch. Bases shall be precast, matching flooring and shall be 4 inches high.

### 3.4 CLEANING AND SEALING

The terrazzo shall be washed with a neutral cleaner and where required shall be cleaned with a fine abrasive to remove any stains or cement smears. The cleaned surfaces shall be rinsed. When dry, a terrazzo sealer shall be applied in accordance with the manufacturer's directions.

### 3.5 PROTECTION

The terrazzo work shall be covered and protected from damage until completion of the work of all other trades.

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## SECTION 09510

## ACOUSTICAL CEILINGS

**07/02**

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM A 641/A 641M	(1998) Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM C 423	(2002) Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
ASTM C 635	(2000) Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings
ASTM C 636	(1996) Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
ASTM C 834	(2000e1) Latex Sealants
ASTM E 580	(2002) Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Moderate Seismic Restraint
ASTM E 795	(2000) Mounting Test Specimens During Sound Absorption Tests
ASTM E 1264	(1998) Acoustical Ceiling Products
ASTM E 1414	(2000a) Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
ASTM E 1477	(1998a) Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers

## U.S. ARMY CORPS OF ENGINEERS (USACE)

TI 809-04	(1998) Seismic Design for Buildings
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## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-02 Shop Drawings

Approved Detail Drawings; G-AE

Drawings showing suspension system, method of anchoring and fastening, details, and reflected ceiling plan.

### SD-03 Product Data

Acoustical Ceiling Systems; G-AE

Manufacturer's descriptive data, catalog cuts, and installation instructions. Submittals which do not provide adequate data for the product evaluation will be rejected.

### SD-04 Samples

Acoustical Units; G-AE

Two samples of each type of acoustical unit and each type of suspension grid tee section showing texture, finish, and color.

### SD-06 Test Reports

Ceiling Attenuation Class and Test; G-AE

Reports by an independent testing laboratory attesting that acoustical ceiling systems meet specified sound transmission requirements.

### SD-07 Certificates

Acoustical Units

Certificate attesting that the mineral based acoustical units furnished for the project contain recycled material and showing an estimated percent of such material.

## 1.3 GENERAL REQUIREMENTS

Acoustical treatment shall consist of sound controlling units mechanically mounted on a ceiling suspension system. The unit size, texture, finish, and color shall be as specified. The location and extent of acoustical treatment shall be as shown on the approved detail drawings. Reclamation of mineral fiber acoustical ceiling panels to be removed from the job site shall be in accordance with paragraph RECLAMATION PROCEDURES.

### 1.3.1 Ceiling Attenuation Class and Test

The ceiling attenuation class (CAC) of the ceiling system shall be 35 when determined in accordance with ASTM E 1414. Provide fixture attenuators over light fixtures and other ceiling penetrations, and provide acoustical blanket insulation adjacent to partitions, as required to achieve the specified CAC. Test ceiling shall be continuous at the partition and shall be assembled in the suspension system in the same manner that the ceiling will be installed on the project.

### 1.3.2 Ceiling Sound Absorption

Determine the NRC in accordance with ASTM C 423 Method of Test.

### 1.3.3 Light Reflectance

Determine light reflectance factor in accordance with ASTM E 1477 Test Method.

## 1.4 DELIVERY AND STORAGE

Materials shall be delivered to the site in the manufacturer's original unopened containers with brand name and type clearly marked. Materials shall be carefully handled and stored in dry, watertight enclosures. Immediately before installation, acoustical ceiling systems shall be stored for not less than 24 hours at the same temperature and relative humidity as the space where they will be installed in order to assure proper temperature and moisture acclimation.

## 1.5 ENVIRONMENTAL REQUIREMENTS

A uniform temperature of not less than 60 degrees F nor more than 85 degrees F and a relative humidity of not more than 70 percent shall be maintained for 24 hours before, during, and 24 hours after installation of acoustical units.

## 1.6 SCHEDULING

Interior finish work such as plastering, concrete and terrazzo work shall be complete and dry before installation. Mechanical, electrical, and other work above the ceiling line shall be completed and heating, ventilating, and air conditioning systems shall be installed and operating in order to maintain temperature and humidity requirements.

## 1.7 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one year period shall be provided. Standard performance guarantee or warranty shall contain an agreement to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to, sagging and warping of panels; rusting and manufacturers defects of grid system.

## 1.8 EXTRA MATERIALS

Spare tiles of each color shall be furnished at the rate of 10 tiles for each 1000 tiles installed. Tiles shall be from the same lot as those installed.

## PART 2 PRODUCTS

### 2.1 ACOUSTICAL UNITS

Contractor shall comply with EPA requirements in accordance with Section 01670 RECYCLED / RECOVERED MATERIALS. Acoustical units shall conform to ASTM E 1264, Class A, and the following requirements:

#### 2.1.1 Units for Exposed-Grid System ACT-1

Type: III (non-asbestos mineral fiber with painted finish).

Pattern: EI.

Nominal size: 24 by 24 inches.

Edge detail: Square.

Finish: Factory-applied standard finish.

Minimum LR coefficient: LR-1, .84.

Minimum CAC: 35.

Flame Spread: Class A, 25 or less

#### 2.1.2 Metal Pans ACT-2

Type: VII, aluminum perforated pans with acoustical, non-asbestos, insulation backing.

Minimum NRC: 0.65 when tested on mounting Type E-400 of ASTM E 795.

Nominal size: 24 by 24 inches.

Edge detail: Manufacturer's standard square edge.

Finish: Factory-applied standard clear anodized finish.

Pads: Completely enclosed, of material and thickness required for acoustical and fire test ratings .

Flame Spread: Class A, 25 or less.

Perforation Pattern: To be selected from manufacturer's standard selection.

### 2.2 SUSPENSION SYSTEM

Suspension system shall be standard, exposed-grid standard width flange, and shall conform to ASTM C 635 for intermediate-duty systems. Surfaces exposed to view shall be steel with a factory-applied white and black baked-enamel finish. Wall molding shall have a flange of not less than 15/16 inch. Mitered corners shall be provided. Suspended ceiling framing system shall have the capability to support the finished ceiling, light fixtures, air diffusers, and accessories, as shown. The suspension system shall have a maximum deflection of 1/360 of span length. Seismic details

shall conform to the guidance in TI 809-04 and ASTM E 580 as shown on the drawings.

### 2.3 DEEP EDGE SYSTEM

Deep edge perimeter system for Room 222 only shall be manufacturer's standard 6 inch deep painted steel edge system designed to match specified ACT-2 suspension system.

### 2.4 HANGERS

Hangers and attachment shall support a minimum 300 pound ultimate vertical load without failure of supporting material or attachment.

#### 2.4.1 Wires

Wires shall conform to ASTM A 641/A 641M, Class 1, 0.106 inches in diameter.

### 2.5 ACCESS PANELS

Access panels shall match adjacent acoustical units and shall be designed and equipped with suitable framing and fastenings for removal and replacement without damage. Panel shall be not less than 12 by 12 inches or more than 12 by 24 inches.

a. An identification plate of 0.032 inch thick aluminum, 3/4 inch in diameter, stamped with the letters "AP" and finished the same as the unit, shall be attached near one corner on the face of each access panel.

b. Identify ceiling access panel by a number utilizing white identification plates or plastic buttons with contrasting numerals. The plates or buttons shall be of minimum 1 inch diameter and securely attached to one corner of each access unit. Provide a typewritten card framed under glass listing the code identification numbers and corresponding system descriptions listed above. Mount the framed card where directed and furnish a duplicate card to the Contracting Officer. Code identification system shall be as follows:

- 1 Fire detection/alarm system
- 2 Air conditioning controls
- 3 Plumbing system
- 4 Heating and steam systems
- 5 Air conditioning duct system
- 6 Sprinkler system
- 7 Intercommunication system
- 8 Telephone junction boxes

### 2.6 ADHESIVE

Adhesive shall be as recommended by tile manufacturer.



## 2.7 FINISHES

Acoustical units and suspension system members shall have manufacturer's standard textures, patterns and finishes as specified. Ceiling suspension system components shall be treated to inhibit corrosion.

## 2.8 COLORS AND PATTERNS

Colors and patterns for acoustical units and suspension system components shall be as specified in Section 09915 COLOR SCHEDULE.

## 2.9 ACOUSTICAL SEALANT

Acoustical sealant shall conform to ASTM C 834, nonstaining.

# PART 3 EXECUTION

## 3.1 INSTALLATION

Mechanical, electrical, and other work above the ceiling line shall be completed and approved prior to the start of acoustical ceiling installation. Acoustical work shall be provided complete with necessary fastenings, clips, and other accessories required for a complete installation. Mechanical fastenings shall not be exposed in the finished work. Hangers shall be laid out for each individual room or space. Hangers shall be placed to support framing around beams, ducts, columns, grilles, and other penetrations through ceilings. Main runners and carrying channels shall be kept clear of abutting walls and partitions. At least two main runners shall be provided for each ceiling span. Wherever required to bypass an object with the hanger wires, a subsuspension system shall be installed, so that all hanger wires will be plumb.

### 3.1.1 Suspension System

Suspension system shall be installed in accordance with ASTM C 636 and as specified herein. There shall be no hanger wires or other loads suspended from underside of steel decking.

#### 3.1.1.1 Plumb Hangers

Hangers shall be plumb and shall not press against insulation covering ducts and pipes. Where lighting fixtures are supported from the suspended ceiling system, hangers shall be provided at a minimum of four hangers per fixture and located not more than 6 inches from each corner of each fixture. See Section 16415A ELECTRIC WORK, INTERIOR.

#### 3.1.1.2 Splayed Hangers

Where hangers must be splayed (sloped or slanted) around obstructions, the resulting horizontal force shall be offset by bracing, countersplaying, or other acceptable means.

### 3.1.2 Wall Molding

Wall molding shall be provided where ceilings abut vertical surfaces. Miter corners where wall moldings intersect or install corner caps. Wall molding shall be secured not more than 3 inches from ends of each length and not more than 16 inches on centers between end fastenings. Wall

molding springs shall be provided at each acoustical unit in semi-exposed or concealed systems.

#### 3.1.3 Acoustical Units

Acoustical units shall be installed in accordance with the approved installation instructions of the manufacturer. Edges of acoustical units shall be in close contact with metal supports, with each other, and in true alignment. Acoustical units shall be arranged so that units less than one-half width are minimized. Units in exposed-grid system shall be held in place with manufacturer's standard hold-down clips, if units weigh less than 1 psf or if required for fire resistance rating.

#### 3.1.4 Deep Edge System

Deep edge system shall be installed in accordance with ASTM C 636 and specified above for the suspension system.

#### 3.2 CEILING ACCESS PANELS

Ceiling access panels shall be located directly under the items which require access.

#### 3.3 CLEANING

Following installation, dirty or discolored surfaces of acoustical units shall be cleaned and left free from defects. Units that are damaged or improperly installed shall be removed and new units provided as directed.

#### 3.4 RECLAMATION PROCEDURES

Ceiling tile, designated for recycling by the Contracting Officer, shall be neatly stacked on 4 by 4 foot pallets not higher than 4 foot. Panels shall be completely dry. Pallets shall then be shrink wrapped and symmetrically stacked on top of each other without falling over.

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## SECTION 09650

## RESILIENT FLOORING

**11/03**

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM D 2047	(1999) Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine
ASTM D 4078	(2002) Water Emulsion Floor Polish
ASTM D 412	(1998a) Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
ASTM E 648	(2000) Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
ASTM F 137	(2003) Standard Test Method For Flexibility Of Resilient Flooring Materials With Cylindrical Mandrel Apparatus
ASTM F 710	(2003) Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
ASTM F 925	(2002) Standard Test Method For Resistance To Chemicals Of Resilient Flooring
ASTM F 970	(2000; w/Chg) Standard Test Method For Static Load Limit
ASTM F 1482	(2003) Standard Practice for Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring
ASTM F 1861	(2002) Resilient Wall Base
ASTM F 1869	(1998) Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
ASTM F 2034	(2003) Sheet Linoleum Floor Covering

ASTM F 2169 (2002) Resilient Stair Treads

ASTM F 2170 (2002) Standard Test Method for  
Determining Relative Humidity in Concrete  
Floor Slabs in situ Probes

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule #1168 (2003) Adhesive and Sealant Applications

1.2 FIRE RESISTANCE REQUIREMENTS

Flooring in corridors and exits shall have a minimum average critical radiant flux of 0.22 watts per square centimeter when tested in accordance with ASTM E 648.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Resilient Flooring and Accessories; G-AE

Manufacturer's descriptive data.

Adhesives

Manufacturer's descriptive data, documentation stating physical characteristics, and mildew and germicidal characteristics. Material Safety Data Sheets (MSDS) for all primers and adhesives shall be provided to the Contracting Officer. Highlight VOC emissions.

SD-04 Samples

Resilient Flooring and Accessories; G-AE

Three samples of each indicated color and type of flooring, base, mouldings, and accessories. Sample size shall be minimum 2-1/2 x 4 inches.

SD-06 Test Reports

Moisture, Alkalinity and Bond Tests; G-AO

Copy of test reports of moisture and alkalinity content of concrete slab, and bond test stating date of test, person conducting the test, and the area tested.

SD-08 Manufacturer's Instructions

Surface Preparation

## Installation

Manufacturer's printed installation instructions for all flooring materials and accessories, including preparation of substrate, seaming techniques, and recommended adhesives.

### SD-10 Operation and Maintenance Data

#### Resilient Flooring and Accessories; G-AO

Data Package 1 in accordance with Section 01781 OPERATION AND MAINTENANCE DATA.

### 1.4 DELIVERY AND STORAGE

Materials shall be delivered to the building site in original unopened containers bearing the manufacturer's name, style name, pattern color name and number, production run, project identification, and handling instructions. Materials shall be stored in a clean dry area with temperature maintained above 68 degrees F and below 85 degrees F, and shall be stacked according to manufacturer's recommendations. Materials shall be protected from the direct flow of heat from hot-air registers, radiators and other heating fixtures and appliances. Do not open containers until materials are to be used, except for verification inspection. Observe ventilation and safety procedures specified in the MSDS.

### 1.5 ENVIRONMENTAL REQUIREMENTS

Areas to receive resilient flooring shall be maintained at a temperature above 68 degrees F and below 85 degrees F for 2 days before application, during application and 2 days after application, unless otherwise directed by the flooring manufacturer for the flooring being installed. A minimum temperature of 55 degrees F shall be maintained thereafter. Observe ventilation and safety procedures specified in the MSDS. Provide adequate ventilation to remove moisture from area and to comply with regulations limiting concentrations of hazardous vapors.

### 1.6 SCHEDULING

Resilient flooring application shall be scheduled after the completion of other work which would damage the finished surface of the flooring.

### 1.7 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one year period shall be provided.

### 1.8 EXTRA MATERIALS

Extra flooring material of each color and pattern shall be furnished at the rate of 50 tiles for each 1000 tiles and 50 square feet for each 1000 square feet of sheet flooring installed. Extra wall base material composed of 20 linear feet of each type, color and pattern shall be furnished. All extra materials shall be packaged in original properly marked containers bearing the manufacturer's name, brand name, pattern color name and number, production run, and handling instructions. Extra materials shall be from the same lot as those installed. Leave extra stock at site in location as directed by Contracting Officer.

## PART 2 PRODUCTS

## 2.1 RUBBER SHEET FLOORING TYPE RBR-1

Rubber sheet flooring shall be resilient rubber flooring with the appearance of terrazzo, made from high-quality, medium and jumbo-sized reprocessed EPDM rubber with high slip resistance, cushioned resistance, stain resistance and consistent color with no wear layer, minimum 48 inches wide. Surface shall be smooth. Overall thickness shall be 5/32 inch thick. Flooring shall comply with the following:

- a. Tensile Strength, lb/in<sup>2</sup> (ASTM D 412): 150 min.
- b. Flexibility, 1/4 inch mandrel (ASTM F 137): pass
- c. Static Load, 400 lb/in<sup>2</sup> (ASTM F 970): less than 0.005 in.
- d. Coefficient of Friction (ASTM D 2047): greater than 0.9
- e. Chemical Resistance (ASTM F 925):
  - 5% Acetic Acid; No Change
  - 70% Isopropyl Alcohol: No Change
  - 5% Sodium Hydroxide: No Change
  - 5% Hydrochloric Acid: No Change
  - 5% Ammonia: No Change
  - Bleach: No Change
  - 5% Phenol: No Change
  - Sulfuric Acid: No Change

## 2.2 SHEET LINOLEUM LIN-1, LIN-2, LIN-3

Linoleum shall conform to ASTM F 2034 and consist of a homogeneous layer of a mixture of linoleum cement (binder in linoleum consisting of a mixture of linseed oil, pine rosin, fossil, or other resins or rosins, or an equivalent oxidized oleoresinous binder), cork and/or wood flour, mineral fillers, and pigments bonded to a jute backing. Linoleum shall not be less than 6 feet wide and overall thickness shall not be less than 0.100 inches.

As required, provide welding rods as recommended by the manufacturer for heat welding of joints.

## 2.3 WALL BASE

Base shall conform to ASTM F 1861, Type TV (thermoplastic vinyl), Style A (straight - installed with carpet) and Style B (coved - installed with resilient flooring). Base shall be 4 inches high and a minimum 1/8 inch thick. Job formed corners in matching height, shape, and color shall be furnished.

## 2.4 STAIR TREADS AND RISERS

Treads and risers shall conform to ASTM F 2169 Type TP (thermoplastic rubber). Surface of treads shall conform to ASTM F 2169 Class 2 hammered. Nosing shall be square. Design shall be either a one piece nosing/tread/riser or a two piece nosing/tread with a matching coved riser.

## 2.5 MOULDING

Provide tapered mouldings of vinyl and types as recommended by flooring manufacturer for both edges and transitions of flooring materials specified. Vertical lip on moulding shall not be greater than 1/4 inch. Change in level between 1/4 and 1/2 inch shall be beveled with a slope no greater than 1:2.

## 2.6 ADHESIVES

Adhesives for flooring, base and accessories shall be as recommended by the manufacturer and comply with local indoor air quality standards. VOC content must be less than the current VOC content limits of SCAQMD Rule #1168.

## 2.7 SURFACE PREPARATION MATERIALS

Surface preparation materials, such as panel type underlayment, lining felt, and floor crack fillers shall be as recommended by the flooring manufacturer for the subfloor conditions.

## 2.8 POLISH/FINISH

Polish shall be as recommended by the manufacturer and conform to ASTM D 4078.

## 2.9 CAULKING AND SEALANTS

Caulking and sealants shall be in accordance with Section 07920 JOINT SEALANTS.

## 2.10 MANUFACTURER'S COLOR, PATTERN AND TEXTURE

Color, pattern and texture for resilient flooring and accessories shall be in accordance with Section 09915 COLOR SCHEDULE. Color listed is not intended to limit the selection of equal colors from other manufacturers. Floor patterns shall be as specified in the drawings. Flooring in any one continuous area or replacement of damaged flooring in continuous area shall be from same production run with same shade and pattern.

# PART 3 EXECUTION

## 3.1 EXAMINATION/VERIFICATION OF CONDITIONS

The Contractor shall examine and verify that site conditions are in agreement with the design package and shall report all conditions that will prevent a proper installation. The Contractor shall not take any corrective action without written permission from the Government. Work will proceed only when conditions have been corrected and accepted by the installer.

## 3.2 SURFACE PREPARATION

Flooring shall be in a smooth, true, level plane, except where indicated as sloped. Floor shall be flat to within 3/16 inch in 10 feet. Subfloor shall be prepared in accordance with flooring manufacturers recommended instructions. The surfaces of lightweight concrete slabs (as defined by the flooring manufacturer) shall be prepared as recommended by the flooring manufacturer. Concrete subfloor preparation shall comply with ASTM F 710. Floor fills or toppings may be required as recommended by the flooring manufacturer. Underlayments when required by the flooring manufacturer shall be installed in accordance with manufacturer's recommended installation instructions. Panel type underlayments shall comply with ASTM F 1482. Before any work under this section is begun, all defects such as rough or scaling concrete, chalk and dust, cracks, low spots, high spots, and uneven surfaces shall have been corrected, and all damaged portions of concrete slabs shall have been repaired as recommended by the flooring



manufacturer. Concrete curing and sealer compounds, other than the type that does not adversely affect adhesion, shall be entirely removed from the slabs. Paint, varnish, oils, release agents, sealers, waxers, and adhesives shall be removed, as recommended by the flooring manufacturer.

### 3.3 MOISTURE, ALKALINITY AND BOND TESTS

The suitability of the concrete subfloor for receiving the resilient flooring with regard to moisture content and pH level shall be determined by moisture and alkalinity tests and shall comply with manufacturers recommendations. Moisture testing shall be in accordance with ASTM F 1869 or ASTM F 2170 unless otherwise recommended by the flooring manufacturer. Alkalinity testing shall be as recommended by the flooring manufacturer. The compatibility of the resilient flooring adhesives to the concrete floors shall be determined by a bond test in accordance with the flooring manufacturers recommendations.

### 3.4 PLACING SHEET LINOLEUM FLOORING

Sheet linoleum flooring and accessories shall be installed in accordance with manufacturer's installation instructions. Adhesives shall be prepared and applied in accordance with manufacturers directions. Flooring lines and joints shall be square, symmetrical, tight, and even. Keep each floor in true, level plane, except where slope is indicated. Flooring shall be cut to, and fitted around, all permanent fixtures, built-in furniture and cabinets, pipes, and outlets. Flooring shall be cut, fitted, and scribed to walls and partitions after field flooring has been applied. Seams shall be cut by overlapping or underscribing as recommended by the manufacturer. Seams of sheet linoleum flooring shown on the drawings shall be heat welded in accordance with the manufacturer's written installation instructions. Finish joints flush, free from voids, recesses, and raised areas.

### 3.5 PLACING RUBBER SHEET FLOORING

Rubber flooring and accessories shall be installed in accordance with manufacturer's installation instructions. Adhesives shall be prepared and applied in accordance with manufacturers directions. Flooring lines and joints shall be square, symmetrical, tight, and even. Keep each floor in true, level plane, except where slope is indicated. Seams shall be cut by overlapping or underscribing as recommended by the manufacturer. Flooring shall be cut to, and fitted around, all permanent fixtures, built-in furniture and cabinets, pipes, and outlets. Flooring shall be cut, fitted, and scribed to walls and partitions after field flooring has been applied.

### 3.6 PLACING MOULDING

Provide moulding where flooring termination is higher than the adjacent finished flooring and at transitions between different flooring materials. When required, locate moulding under door centerline. Moulding is not required at doorways where thresholds are provided. Moulding shall be secured with adhesive as recommended by the manufacturer. Adhesives shall be prepared and applied in accordance with manufacturers directions.

### 3.7 PLACING WALL BASE

Wall base shall be installed in accordance with manufacturer's installation instructions. Adhesives shall be prepared and applied in accordance with manufacturers directions. Base joints shall be tight and base shall be even with adjacent resilient flooring. Voids along the top edge of base at

masonry walls shall be filled with caulk. Roll entire vertical surface of base with hand roller, and press toe of base with a straight piece of wood to ensure proper alignment. Avoid excess adhesive in corners. Voids along the top edge of base at masonry walls shall be filled with caulk.

### 3.8 PLACING STAIR TREADS AND RISERS

Stair treads and risers shall be securely attached and installed in accordance with manufacturer's installation instructions. Adhesives shall be prepared and applied in accordance with manufacturers directions. Treads and risers shall cover the full width of the stairs. Stairs wider than manufacturer's standard lengths shall have equal length pieces butted together to cover the treads.

### 3.9 CLEANING

Immediately upon completion of installation of flooring in a room or an area, flooring and adjacent surfaces shall be dry-cleaned to remove all surplus adhesive. Clean flooring as recommended in accordance with manufacturer's printed maintenance instructions. No sooner than 5 days after installation, flooring shall be washed with a nonalkaline cleaning solution, rinsed thoroughly with clear cold water, and, except for rubber flooring and stair treads and risers, vinyl and other flooring not requiring polish by manufacturer, given the number of coats of polish in accordance with manufacturers written instructions. All other flooring shall be cleaned and maintained as recommended by the manufacturer.

### 3.10 PROTECTION

From the time of laying until acceptance, flooring shall be protected from damage as recommended by the flooring manufacturer. Flooring which becomes damaged, loose, broken, or curled and wall base which is not tight to wall or securely adhered shall be removed and replaced.

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## SECTION 09670

## FLUID-APPLIED FLOORING

11/03

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM D 4060	(2001) Abrasion Resistance of Organic Coatings by the Taber Abraser
ASTM D 570	(1998) Water Absorption of Plastics
ASTM D 638	(2002) Tensile Properties of Plastics
ASTM D 695	(2002a) Compressive Properties of Rigid Plastics
ASTM D 790	(2002) Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910-SUBPART Z	Toxic and Hazardous Substances
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## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-02 Shop Drawings

Flooring; G-AE

Drawings indicating the type and layout of the floor system.

## SD-03 Product Data

Resin; G-AE

Floor Surfacing; G-AE

Mixing; G-AO

Flooring manufacturer's descriptive data, mixing, proportioning, and installation instructions. Maintenance literature for resinous flooring shall be included.

#### SD-04 Samples

Flooring Systems; G-AE

Cured samples of each floor finish or color combination.

#### SD-07 Certificates

Qualifications of Installer

A written statement from the floor manufacturer that the installer is acceptable.

#### SD-08 Manufacturer's Instructions

Application; G-AO

Complete instructions for application of flooring system including any precautions or special handling instructions required to comply with OSHA 29 CFR 1910-SUBPART Z.

#### SD-10 Operation and Maintenance Data

Flooring Systems; G-AO

Data Package 1 in accordance with Section 01781 OPERATION AND MAINTENANCE DATA.

### 1.3 DELIVERY AND STORAGE

Deliver the materials to the project site in unopened bags and containers clearly labeled with the name of the manufacturer, type of material, batch number, and date of manufacture. Store materials, other than aggregates, away from fire, sparks, or smoking areas. Maintain the storage area between 50 and 90 degrees F.

### 1.4 ENVIRONMENTAL CONDITIONS

Maintain the ambient room and floor temperatures at 65 degrees F, or above, for a period extending from 48 hours before installation until one week after installation. Concrete to receive surfacing shall have cured for at least 28 days and shall have been free of water for at least 7 days.

### 1.5 PROTECTION

Protect adjacent surfaces not scheduled to receive the flooring by masking, or by other means, to maintain these surfaces free of the flooring material.

### 1.6 QUALIFICATIONS OF INSTALLER

Installation shall be performed by an applicator approved by the manufacturer of the floor surfacing materials. The Contractor shall furnish a written statement from the manufacturer that the installer is acceptable.

## PART 2 PRODUCTS

## 2.1 MATERIALS

Materials (except aggregate) used in the flooring shall be the products of a single manufacturer. Industrial resin-based flooring shall be trowel applied type two component, 100% solids epoxy finish of thickness specified with properties conforming to the requirements specified. Provide slip-resistant embedded granules, light to medium texture. Materials shall meet the following requirements:

## 2.1.1 Primer

Type recommended by the manufacturer to penetrate into the pores of the substrate and bond with the floor surfacing matrix to form a permanent monolithic bond between substrate and surfacing matrix.

## 2.1.2 Aggregate

Aggregate shall be silica sand, quartz, or other suitable chemical resistant material having a Mohr's hardness of not less than 6.0.

## 2.1.3 Binder

Binder shall be thermo-setting epoxy.

## 2.2 FLOORING SYSTEMS

The complete systems, after curing, shall have the following properties when tested in accordance with the test methods listed for each property.

## 2.2.1 Epoxy Matrix Floor Surfacing

- a. Compressive Strength: ASTM D 695; 25,300 psi minimum at 7 days.
- b. Tensile Strength: ASTM D 638; 3,700 psi minimum at 7 days.
- c. Flexural Modulus of Elasticity: ASTM D 790; 57,700 psi minimum at 7 days.
- d. Abrasion Resistance: ASTM D 4060; 25 mg maximum weight loss AT 1,000 rev.
- e. Water Resistance: ASTM D 570; 0.50 percent maximum.
- k. Chemical Resistance:

<u>Chemical</u>	<u>Rating</u>
Acetic Acid 98%	3
Acetic Acid 36%	2
Acetic Acid 20%	2
Acetic Acid 10%	1
Ammonia 28%	0
Blood	0
Brake Fluid	0-1
Butyl Alcohol	1-2
Butoxyethanol	2

Chemical	Rating
Butoxyethylacetate	2
Butylacrylate	1
Calcium Chloride 10%	0
Chromic Acid 2%	1
Diacetone Alcohol	1
Ethyl Acetate	1
Ethyl Alcohol	1
Ethylene Glycol	0
Formic Acid 38%	2
Isopropyl Alcohol	1
Jet Fuel	0
Ketchup	0
Lactic Acid 85%	0-1
Lactic Acid 50%	1
Lactic Acid 20%	1
Hydrobromic 48%	1
Hydrochloric Acid 37%	0
Hydrochloric Acid 15%	0
Hydrochloric Acid 5%	2
Hydrofluoric Acid 48%	2
Hydrofluoric Acid 24%	2
Methylisobutyl Ketone	0
Methylpyrrolidione	2
Mineral Spirits	0
Motor Oil	0
Mustard	0*
Nitric Acid 30%	2
Nitric Acid 10%	1
Oleic Acid	1-2
Phenol	2
Phosphoric Acid 25%	2
Potassium Hydroxide 25%	0
Propylene Glycol	0
Skydrol	1
Sodium Hypochloride 10%	0
Sodium Hydroxide (50%)	0
Sodium Hydroxide (25%)	0
Solvent 100	1
Sulphuric Acid (96%)	2
Sulphuric Acid (50%)	1
Sulphuric Acid (20%)	1
Sulphuric Acid (10%)	1
Tall Oil Fatty Acid	2
Urine	0*
Vegetable Oil	0
Vinegar	1
Xylene	1

\*Note: Staining is possible with mustard and urine on white and clear systems.

Key to Chemical Rating  
 0 = No Effect  
 1 = Stains/Dulls  
 2 = Blisters  
 3 = Lifts Film

## 2.3 RESIN

Resin shall be suitable for the type application indicated.

## 2.4 COLOR

Color shall be in accordance with Section 09915 COLOR SCHEDULE.

# PART 3 EXECUTION

## 3.1 SURFACE PREPARATION

Remove all dirt, dust, debris, and other loose particles by sweeping or vacuum cleaning.

### 3.1.1 Concrete Surfaces

#### 3.1.1.1 Steel Shot-blasting

Steel shot-blast the surface to remove surface contaminants. Proper care and procedure should be taken to leave the concrete surface as unopened as possible.

#### 3.1.1.2 Air Drying

After cleaning, allow concrete surface to air dry thoroughly prior to application of surfacing. Blowers or oil free compressed air may be used. Do not use flame-drying methods. Prior to application of surfacing, test concrete surface for excessive moisture in at least two locations. Place rubber mats at each location with smooth side against concrete and place weight on top of mat to hold in position and ensure contact with concrete. Polyethylene with all edges taped may be used in lieu of mats. After 8 hours remove mat or sheeting and examine floor surface for moisture accumulation. If tests indicate accumulation of moisture at either location, additional air drying shall be undertaken until additional tests show no moisture accumulation.

#### 3.1.2 Filling Cracks, Spalls, Joints, and Other Depressions

Fill all cracks, joints, spalls, and other depressions in the substrate with a flexible epoxy material, as recommended by the manufacturer compatible with the floor surfacing material.

## 3.2 MIXING

Proportion and mix the floor surfacing components in accordance with the manufacturer's instructions.

## 3.3 APPLICATION

Apply primer, floor surfacing, and seal coat in accordance with the manufacturer's recommendations and the following requirements.

### 3.3.1 Primer

Apply primer uniformly over the entire area to receive floor surfacing using clean rubber squeegees or clean steel trowels. Do not allow primer to collect in depressions. Allow primer to dry thoroughly before the next coat is applied. Reprime porous areas or areas where primer has dried.



### 3.3.2 Floor Surfacing

Apply mixed surfacing material to provide a finish floor surfacing not less than thickness specified. The entire surfacing in any one room or area shall be one continuous operation except for placement of control joints filled with flexible epoxy material at structural floor control joints or as indicated. Route structural floor control joints to a minimum depth of 3/4 inch and install backing and flexible epoxy material recommended by resinous flooring manufacturer. All surfaces shall be flush, true to plane and line, and level within 1/4 inch in 10 feet. Broadcast aggregate as recommended by system manufacturer.

### 3.3.3 Seal Coat

Apply seal coat uniformly covering all surfaces after floor surfacing has cured and as recommended by the supplier, providing approved slip-resistant surface..

### 3.3.4 Fluid-applied Flooring System Thickness

Primer Thickness: 5-6 mils DFT  
Floor Surfacing (base coat): 8-10 mils DFT  
Seal Coat (lock coat): 6-8 mils DFT  
Total System: 19-24 mils DFT

## 3.4 PROTECTION

Surfacing shall set for a minimum period of 48 hours before traffic is allowed on the floor. Finished flooring shall be protected from traffic by covering with 30 pound building paper or other equally effective means until final acceptance of the project.

-- End of Section --

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**11/03**

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## SECTION 09680

CARPET  
11/03

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC 16	(1998) Test Method: Colorfastness to Light
AATCC 134	(2001) Test Method: Electrostatic Propensity of Carpets
AATCC 165	(1999) Test Method: Colorfastness to Crocking: Carpets - AATCC Crockmeter Method

## ASTM INTERNATIONAL (ASTM)

ASTM D 418	(1993; R 1997) Pile Yarn Floor Covering Construction
ASTM D 3278	(1996e1) Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus
ASTM D 5252	(2001) Practice for the Operation of the Hexapod Tumble Drum Tester
ASTM D 5417	(1999) Practice for Operation of the Vettermann Drum Tester
ASTM D 5793	(1995) Standard Test Method for Binding Sites Per Unit Length or Width of Pile Yarn Floor Coverings
ASTM D 5848	(1999) Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Coverings
ASTM E 648	(2000) Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source

## CARPET AND RUG INSTITUTE (CRI)

CRI 104	(2002) Commercial Carpet Installation Standard
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## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

16 CFR 1630	Standard for the Surface Flammability of Carpet and Rugs (FF 1-70)
40 CFR 247	Comprehensive Procurement Guideline for Products Containing Recovered Materials

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-02 Shop Drawings

Installation; G-AE  
Molding; G-AE

Three copies of drawings indicating areas receiving carpet, carpet types, textures and patterns, direction of pile, location of seams, and locations of edge molding.

## SD-03 Product Data

Carpet; G-AE

Manufacturer's catalog data and printed documentation stating physical characteristics, durability, resistance to fading, and flame resistance characteristics for each type of carpet material and installation accessory.

Surface Preparation; G-AO  
Installation; G-AO

Three copies of the manufacturer's printed installation instructions for the carpet, including preparation of substrate, seaming techniques, and recommended adhesives and tapes.

Regulatory Requirements; G-AO

Three copies of report stating that carpet contains recycled materials and/or involvement in a recycling or reuse program. Report shall include percentage of recycled material.

## SD-04 Samples

Carpet; G-AE  
Molding; G-AE

a. Carpet: Two "Production Quality" samples 18 x 18 inches of each carpet proposed for use, showing quality, pattern, and color specified.

b. Vinyl: Two pieces of each type at least 12 inches long.

c. Special Treatment Materials: Two samples showing system and installation method.

#### SD-06 Test Reports

##### Moisture and Alkalinity Tests; G-AO

Three copies of test reports of moisture and alkalinity content of concrete slab stating date of test, person conducting the test, and the area tested.

#### SD-07 Certificates

##### Carpet

Certificates of compliance from a laboratory accredited by the National Laboratory Accreditation Program of the National Institute of Standards and Technology attesting that each type of carpet and carpet with cushion material conforms to the standards specified.

##### Regulatory Requirements; G-AO

Report stating that the carpet contains recycled materials and indicating the actual percentage of recycled material.

#### SD-10 Operation and Maintenance Data

##### Carpet; G-AO

##### Cleaning and Protection; G-AO

Three copies of carpet manufacturer's maintenance instructions describing recommended type of cleaning equipment and material, spotting and cleaning methods, and cleaning cycles.

### 1.3 REGULATORY REQUIREMENTS

Carpet and adhesives shall bear the Carpet and Rug Institute (CRI) Indoor Air Quality (IAQ) label or demonstrate compliance with testing criteria and frequencies through independent laboratory test results. Carpet type bearing the label will indicate that the carpet has been tested and meets the criteria of the CRI IAQ Carpet Testing Program, and minimizes the impact on indoor air quality. Contractor shall procure carpet in accordance with 40 CFR 247. Carpet shall conform to EPA requirements in accordance with Section 01670 RECYCLED / RECOVERED MATERIALS. Where possible, product shall be purchased locally to reduce emissions of fossil fuels from transporting.

### 1.4 DELIVERY AND STORAGE

Materials shall be delivered to the site in the manufacturer's original wrappings and packages clearly labeled with the manufacturer's name, brand name, size, dye lot number, and related information. Materials shall be stored in a clean, dry, well ventilated area, protected from damage and soiling, and shall be maintained at a temperature above 60 degrees F for 2 days prior to installation.

## 1.5 ENVIRONMENTAL REQUIREMENTS

Areas in which carpeting is to be installed shall be maintained at a temperature above 60 degrees F for 2 days before installation, during installation, and for 2 days after installation. A minimum temperature of 55 degrees F shall be maintained thereafter for the duration of the contract. Traffic or movement of furniture or equipment in carpeted area shall not be permitted for 24 hours after installation. Other work which would damage the carpet shall be completed prior to installation of carpet.

## 1.6 WARRANTY

Manufacturer's standard performance guarantees or warranties including minimum ten (10) year wear warranty, two (2) year material and workmanship and ten (10) year tuft bind and delamination.

## 1.7 EXTRA MATERIAL

Extra material from same dye lot consisting of full width continuous broadloom and uncut carpet tiles shall be provided for future maintenance. A minimum of 5 percent of total square yards of each carpet type, pattern, and color shall be provided.

## PART 2 PRODUCTS

### 2.1 CARPET

Carpet shall be first quality; free of visual blemishes, streaks, poorly dyed areas, fuzzing of pile yarn, spots or stains, and other physical and manufacturing defects. Carpet materials and treatments shall be reasonably nonallergenic and free of other recognized health hazards. All grade carpets shall have a static control construction which gives adequate durability and performance. Carpet shall bear the Carpet and Rug Institute (CRI) Indoor Air Quality (IAQ) Label. Carpet type bearing the label will indicate that carpet has been tested and meets the criteria of the CRI Green Label Requirements for Indoor Air Quality Test Criteria.

#### 2.1.1 Physical Characteristics

##### 2.1.1.1 BROADLOOM CARPETCPT-1

Carpet shall comply with the following:

- a. Carpet Construction: Textureweave .
- b. Type: Broadloom 12 feet minimum usable carpet width with exception of corridors.
- c. Pile Type: Multilevel loop.
- d. Pile Fiber: Monsanto Ultratan VIP continuous filament nylon.
- e. Pile or Wire Height: Minimum 7/32 - 4/32 inch in accordance with ASTM D 418.
- f. Gauge or Pitch: Minimum 1/10 inch in accordance with ASTM D 5793.
- g. Stitches or Rows/Wires: Minimum 13 per square inch.

- h. Finished Pile Yarn Weight: Minimum 32 ounces per square yard. This does not include weight of backings. Weight shall be determined in accordance with ASTM D 5848.
- i. Pile Density: Minimum 6777.
- j. Dye Method: Yarn (or Skein) dyed.
- k. Backing Materials: Primary backing materials shall be woven polypropylene . Secondary backing to suit project requirements shall be those customarily used and accepted by the trade for each type of carpet, except when a special unitary back designed for gluedown is provided.

#### 2.1.1.2 BROADLOOM CARPETCPT-2

Carpet shall comply with the following:

- a. Carpet Construction: Textureweave II.
- b. Type: Broadloom 12 feet minimum usable carpet width with exception of corridors.
- c. Pile Type: Multilevel loop.
- d. Pile Fiber: Monsanto Ultratan VIP continuous filament nylon.
- e. Pile or Wire Height: Minimum 8/32 - 4/32inch in accordance with ASTM D 418.
- f. Gauge or Pitch: Minimum 1/10 inch in accordance with ASTM D 5793.
- g. Stitches or Rows/Wires: Minimum 11 per square inch.
- h. Finished Pile Yarn Weight: Minimum 32 ounces per square yard. This does not include weight of backings. Weight shall be determined in accordance with ASTM D 5848.
- i. Pile Density: Minimum 7385.
- j. Dye Method: Yarn (or Skein) dyed.
- k. Backing Materials: Primary backing materials shall be woven polypropylene . Secondary backing to suit project requirements shall be those customarily used and accepted by the trade for each type of carpet, except when a special unitary back designed for gluedown is provided.

#### 2.1.1.3 ENTRANCE MODULAR TILE CARPETCPT-3

Carpet shall comply with the following:

- a. Carpet Construction: Tufted.
- b. Type: Entrance modular tile 18 x 18 inches .
- c. Pile Type: Performance loop.



- d. Pile Fiber: DuPont 6,6 with nylon 6,6 scaperyarn .
- e. Pile or Wire Height: Minimum .249 inch in accordance with ASTM D 418.
- f. Gauge or Pitch: Minimum 5/32 inch in accordance with ASTM D 5793.
- g. Stitches or Rows/Wires: Minimum 8.5per square inch.
- h. Finished Pile Yarn Weight: Minimum 38 ounces per square yard. This does not include weight of backings. Weight shall be determined in accordance with ASTM D 5848.
- i. Dye Method: Yarn (or Skein) dyed.
- j. Backing Materials: Primary backing materials shall be integrated cushion thermabond. Primary backing materials shall be reinforced synthetic. Secondary backing shall be fiberglass reinforced.

#### 2.1.1.4 BROADLOOM CARPET CPT-4, 5

Carpet shall comply with the following:

- a. Carpet Construction: Tufted.
- b. Type: Broadloom 12 feet minimum usable carpet width with exception of corridors.
- c. Pile Type: Graphic Loop.
- d. Pile Fiber: 100% BASF Savant Nylon.
- e. Pile or Wire Height: Minimum 8/32 inch in accordance with ASTM D 418.
- f. Yarn Ply: Minimum 2.
- g. Gauge or Pitch: Minimum 1/10 inch in accordance with ASTM D 5793.
- h. Stitches or Rows/Wires: Minimum 10.0 per square inch.
- i. Finished Pile Yarn Weight: Minimum 32 ounces per square yard. This does not include weight of backings. Weight shall be determined in accordance with ASTM D 5848.
- j. Pile Density: Minimum 7945.
- k. Dye Method: Piece dyed.
- l. Backing Materials: Primary backing materials shall be woven polypropylene. Secondary backing shall be Everbond EX.
- m. Recycle Efforts: Use of nylon fiber with 25 percent minimum recycled content.

#### 2.2 Performance Requirements

- a. ARR (Appearance Retention Rating): Carpet shall be tested and

have the minimum 3.0-3.5 (Heavy), in offices, and 3.5-4.0 (Severe), in corridor applications, ARR when tested in accordance with either the ASTM D 5252 (Hexapod) or ASTM D 5417 (Vettermann) test methods using the number of cycles for short and long term tests as specified.

b. Static Control: Static control shall be provided to permanently control static buildup to less than 3.5 kV when tested at 20 percent relative humidity and 70 degrees F in accordance with AATCC 134.

c. Flammability and Critical Radiant Flux Requirements: Carpet shall comply with 16 CFR 1630. Carpet in corridors and exits shall have a minimum average critical radiant flux of 0.22 watts per square centimeter when tested in accordance with ASTM E 648.

d. Tuft Bind: Tuft bind force required to pull a tuft or loop free from carpet backing shall be a minimum 10 pound average force for loop pile.

e. Colorfastness to Crocking: Dry and wet crocking shall comply with AATCC 165 and shall have a Class 4 minimum rating on the AATCC Color Transference Chart for all colors.

f. Colorfastness to Light: Colorfastness to light shall comply with AATCC 16, Test Option E "Water-Cooled Xenon-Arc Lamp, Continuous Light" and shall have a minimum 4 grey scale rating after 40 hours.

g. Delamination Strength: Delamination strength for tufted carpet with a secondary back shall be minimum of 2.5 lbs./inch.

### 2.3 ADHESIVES AND CONCRETE PRIMER

Adhesives and concrete primers for installation of carpet shall be waterproof, nonflammable, meet local air-quality standards, and shall be as required by the carpet manufacturer. Seam adhesive shall be waterproof, nonflammable, and nonstaining as recommended by the carpet manufacturer. Release adhesive for modular tile carpet shall be as recommended by the carpet manufacturer. Adhesives flashpoint shall be minimum 140 degrees F in accordance with ASTM D 3278.

### 2.4 MOLDING

Vinyl molding shall be heavy-duty and designed for the type of carpet being installed. Floor flange shall be a minimum 2 inches wide. Color shall be in accordance with Section 09915 COLOR SCHEDULE.

### 2.5 TAPE

Tape for seams shall be as recommended by the carpet manufacturer for the type of seam used in installation.

### 2.6 COLOR, TEXTURE, AND PATTERN

Color, texture, and pattern shall be in accordance with Section 09915 COLOR SCHEDULE.

## PART 3 EXECUTION

### 3.1 SURFACE PREPARATION

Carpet shall not be installed on surfaces that are unsuitable and will prevent a proper installation. Holes, cracks, depressions, or rough areas shall be repaired using material recommended by the carpet or adhesive manufacturer. Floor shall be free of any foreign materials and swept broom clean. Before beginning work, subfloor shall be tested with glue and carpet to determine "open time" and bond.

### 3.2 MOISTURE AND ALKALINITY TESTS

Concrete slab shall be tested for moisture content and excessive alkalinity in accordance with CRI 104.

### 3.3 PREPARATION OF CONCRETE SUBFLOOR

Installation of the carpeting shall not commence until concrete substrate is at least 90 days old. The concrete surfaces shall be prepared in accordance with instructions of the carpet manufacturer. Type of concrete sealer, when required, shall be compatible with the carpet.

### 3.4 INSTALLATION

All work shall be performed by installers who are CFI certified (International Certified Floorcovering Installer Association), or manufacturer's approved installers. Installation shall be in accordance with the manufacturer's instructions and CRI 104. Edges of carpet meeting hard surface flooring shall be protected with molding; installation shall be in accordance with the molding manufacturer's instructions. Ventilation, personal protection, and other safety precautions recommended by the manufacturer of the adhesive shall be followed. Ventilation shall continue for at least 72 hours following installation.

#### 3.4.1 Broadloom Installation

Broadloom carpet shall be installed direct glue down and shall be smooth, uniform, and secure, with a minimum of seams. Seams shall be regular, unnoticeable, and treated with a seam adhesive. Side seams shall be run toward the light where practical and where such layout does not increase the number of seams. Breadths shall be installed parallel, with carpet pile in the same direction. Patterns shall be accurately matched. Cutouts, as at door jams, columns and ducts shall be neatly cut and fitted securely. Seams at doorways shall be located parallel to and centered directly under doors. Seams shall not be made perpendicular to doors or at pivot points. Seams at changes in directions of corridors shall follow the wall line parallel to the carpet direction. Corridors with widths less than 6 feet shall have the carpet laid lengthwise down the corridors.

#### 3.4.2 Modular Tile Installation

Modular tiles shall be installed with permanent vinyl-compatible adhesive and shall be snugly jointed together. Tiles shall be laid in an alternating pattern with accessibility to the subfloor where required.

### 3.5 CLEANING AND PROTECTION

#### 3.5.1 Cleaning

After installation of the carpet, debris, scraps, and other foreign matter shall be removed. Soiled spots and adhesive shall be removed from the face of the carpet with appropriate spot remover. Protruding face yarn shall be cut off and removed. Carpet shall be vacuumed clean.

#### 3.5.2 Protection

The installed carpet shall be protected from soiling and damage with heavy, reinforced, nonstaining kraft paper, plywood, or hardboard sheets. Edges of kraft paper protection shall be lapped and secured to provide a continuous cover. Traffic shall be restricted for at least 45 hours. Protective covering shall be removed when directed by the Contracting Officer.

### 3.6 REMNANTS

Remnants remaining from the installation, consisting of scrap pieces more than 2 feet in dimension with more than 6 square feet total, shall be provided. Non-retained scraps shall be removed from site and recycled appropriately.

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11/03

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## SECTION 09720

## WALLCOVERINGS

11/03

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM E 84 (2001) Surface Burning Characteristics of Building Materials

## CHEMICAL FABRICS &amp; FILM ASSOCIATION (CFFA)

CFFA-W-101-D (2002) Vinyl Coated Fabric Wallcovering

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 265 (2002) Fire Tests for Evaluating Room Fire Growth Contribution of Textile Coverings on Full Height Panels and Walls

NFPA 286 (2000) Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth

## INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO)

UBC 8-2 (1994) Uniform Building Code Standard No. 8-2, Standard Test Method for Evaluating Room Fire Growth Contribution of Textile Wall Coverings

UBC 42-2 (1991) Uniform Building Code Standard No. 42-2, Standard Test Method for Evaluating Room Fire Growth Contribution of Textile Wall Coverings

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

## Wallcoverings and Accessories; G-AE

Wallcovering manufacturer's descriptive data, documentation stating physical characteristics, flame resistance, mildew and germicidal characteristics.

## Primer and Adhesive

Manufacturer's descriptive data, documentation stating physical characteristics, mildew and germicidal characteristics. Submit Material Safety Data Sheets (MSDS) for all primers and adhesives to the Contracting Officer. Highlight VOC emissions.

## SD-04 Samples

## Wallcoverings and Accessories; G-AE

Four samples of each indicated type, pattern, and color of wallcovering. Samples of wallcovering shall be minimum 5 x 7 inches and of sufficient size to show pattern repeat.

## SD-07 Certificates

## Wallcoverings and Accessories

Manufacturer's statement attesting that the product furnished meets or exceeds specification requirements. The statement must; be dated after the award of the contract, state Contractor's name and address, name the project and location, and list the requirements being certified.

## SD-08 Manufacturer's Instructions

## Wallcoverings and Accessories

Preprinted installation instructions for wallcovering and accessories, adhesives and primers. Instructions shall include preparation of the substrate.

## SD-10 Operation and Maintenance Data

## Wallcoverings; G-AO

Submit Data Package 1 in accordance with Section 01781 OPERATION AND MAINTENANCE DATA.

## 1.3 DELIVERY AND STORAGE

Deliver the material to the site in manufacturer's original wrappings and packages and clearly label with the manufacturer's name, brand name, pattern and color name and number, dye lot number, size, and other related information. Store in a safe, dry, clean, and well-ventilated area at temperatures not less than 50 degrees F and within a relative humidity range of 30 to 60 percent. Store wallcovering material in a flat position and protect from damage, soiling, and moisture. Do not open containers until needed for installation, unless verification inspection is required.

#### 1.4 ENVIRONMENTAL REQUIREMENTS

Minimum temperature of area to receive wallcovering, before, during, and after installation, and requirements for conditioning adhesive and wallcovering shall comply with the wallcovering manufacturer's printed instructions. However, in no case shall the area temperature be less than 50 degrees F, 72 hours prior to, during installation, and until the adhesive is dry. A minimum temperature of 55 degrees F shall be maintained thereafter. Observe ventilation and safety procedures specified in the MSDS.

#### 1.5 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one-year period shall be provided.

#### 1.6 EXTRA MATERIALS

Provide one linear foot of full-width wallcovering of each pattern and color for each 20 linear feet of wallcovering installed. Extra stock shall be of the same manufacturer, type, pattern, color, and lot number as the installed wallcovering. Provide full rolls, packed for storage and marked with content, manufacturer's name, pattern and color name and number and dye lot number. Leave extra stock at the site at a location as directed by the Contracting Officer.

#### 1.7 MAINTENANCE INSTRUCTIONS

Provide preprinted cleaning and maintenance instructions for wall covering.

### PART 2 PRODUCTS

#### 2.1 WALLCOVERINGS

Wallcoverings and accessories shall be material designed specifically for the specified use. Vinyl wallcovering and borders shall be mercury, cadmium, lead, and chromium free. Wallcoverings shall contain bactericides and mildew inhibitors to protect against microbiological and mildew growth.

##### 2.1.1 Vinyl Wallcovering VWC-1, 2, 3, 4

Vinyl wallcovering shall be vinyl coated woven or nonwoven fabric. Vinyl wallcovering shall conform to CFFA-W-101-D, Type II (Medium Duty) with a minimum total weight of 13 ounces per square yard and 20 ounces per linear yard. Width shall be 52/54 inches. Vinyl wallcovering shall be tested in accordance with NFPA 286 or have a Class A flame spread rating of 0-25 and smoke development rating of 0-450 when tested in accordance with ASTM E 84.

#### 2.2 PRIMER AND ADHESIVE

Primer and adhesive shall be of a type recommended by the wallcovering manufacturer, contain a non-mercury based mildewcide, and comply with local indoor air quality standards. Primer shall permit removal of the wallcovering and protect the wall surface during removal, gypsum wallboard facing paper shall not be damaged during removal of wallcovering. Adhesive shall be strippable. When required, primer and adhesive for textile wallcovering shall be of the type used for testing to comply with NFPA 265,



UBC 42-2, or UBC 8-2 requirements. When substrate color variations show through vinyl wallcovering, a white pigmented primer as recommended by the wallcovering manufacturer shall be used to conceal the variations. Adhesive to install cornerguards and wainscot cap shall be of a type recommended by the manufacturer of the cornerguards and wainscot cap.

## 2.3 COLOR, TEXTURE, AND PATTERN

Color shall be in accordance with Section 09915 COLOR SCHEDULE. Color listed is not intended to limit the selection of equal colors from other manufacturers.

## PART 3 EXECUTION

### 3.1 EXAMINATION

Contractor shall inspect all areas and conditions under which wallcoverings are to be installed. Contractor shall notify the Contracting Officer in writing of any conditions detrimental to the proper and timely completion of the installation. Work will proceed only when conditions have been corrected and accepted by the installer.

### 3.2 SURFACE PREPARATION

Walls shall be prepared for proper installation of wallcovering in accordance with wallcovering manufacturers instructions. Wallcovering shall not be applied to surfaces that are rough, that contain stains that will bleed through the wallcovering, or that are otherwise unsuitable for proper installation. Cracks and holes shall be filled and rough spots shall be sanded smooth. Surfaces to receive wallcovering shall be dry. Moisture content of gypsum wallboard to receive wallcovering and the type of moisture meter used shall be as recommended by the wallcovering manufacturer. Interior surfaces of new and existing gypsum wallboard shall be primed with a wallcovering primer in accordance with the manufacturer's instructions. As required, white primer shall be used when substrate color variations are visible through thin or light color wallcovering. Primers and adhesives shall be prepared and applied in accordance with manufacturers instructions. Surface of walls shall be primed as required by wallcovering manufacturer's instructions to permit ultimate removal of wallcovering from the wall surface. Primer shall be allowed to completely dry before adhesive application.

### 3.3 INSTALLATION

#### 3.3.1 Wallcovering

Wallcovering shall be installed in accordance with the manufacturer's installation instructions. Glue and adhesive spillage shall be immediately removed from wallcovering face and seams with a remover recommended by the manufacturer.

### 3.4 CLEAN-UP

Upon completion of the work, wallcovering shall be left clean and free of dirt, soiling, stain, or residual film. Surplus materials, rubbish, and debris resulting from the wallcovering installation shall be removed and area shall be left clean.

-- End of Section --



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## SECTION 09900

## PAINTS AND COATINGS

11/03

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH 0100Doc (2001) Documentation of the Threshold  
Limit Values and Biological Exposure  
Indices

## ASTM INTERNATIONAL (ASTM)

ASTM D 523 (1989; R 1999) Specular Gloss

ASTM D 2092 (1995) Preparation of Zinc-Coated  
(Galvanized) Steel Surfaces for Painting

ASTM D 4263 (1983; R 1999) Indicating Moisture in  
Concrete by the Plastic Sheet Method

ASTM D 4444 (1998) Standard Test Methods for Use and  
Calibration of Hand-Held Moisture Meters

## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.1000 Air Contaminants

## U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FED-STD-313 (Rev. C) Material Safety Data,  
Transportation Data and Disposal Data for  
Hazardous Materials Furnished to  
Government Activities

## MASTER PAINTERS INSTITUTE (MPI)

MPI 46 (2001) Interior Enamel Undercoat

MPI 49 (2001) Interior Alkyd, Flat

MPI 50 (2001) Interior Latex Primer Sealer

MPI 52 (2001) Interior Latex, Gloss Level 3

MPI 57 (2001) Interior Oil Modified Clear  
Urethane, Satin

MPI 64 (July 2002) Fire Retardant Flat Coating

(water based)

MPI 79	(2001) Marine Alkyd Metal Primer
MPI 94	(2001) Exterior Alkyd, Semi-Gloss
MPI 101	(2001) Cold Curing Epoxy Primer
MPI 107	(2001) Rust Inhibitive Primer (Water-Based)
MPI 110	(2001) Interior/Exterior High Performance Acrylic

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-101	(Rev. B) Color Code for Pipelines and for Compressed Gas Cylinders
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SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS SP01-01	(2001) Environmentally Preferable Product Specification for Architectural and Anti-Corrosive Paints
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THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC QP 1	(1989) Evaluating Qualifications of Painting Contractors (Field Application to Complex Structures)
SSPC PA 1	(2000) Shop, Field, and Maintenance Painting
SSPC Guide 3	(1995) Safety in Paint Application
SSPC VIS 1	(1989) Visual Standard for Abrasive Blast Cleaned Steel (Standard Reference Photographs)
SSPC VIS 3	(1993) Visual Standard for Power- and Hand-Tool Cleaned Steel (Standard Reference Photographs)
SSPC VIS 4	(2001) Guide and Reference Photographs for Steel Surfaces Prepared by Waterjetting
SSPC SP 1	(1982; R 2000) Solvent Cleaning
SSPC SP 2	(1995) Hand Tool Cleaning
SSPC SP 3	(1982; R 2000) Power Tool Cleaning
SSPC SP 6	(2000) Commercial Blast Cleaning
SSPC SP 7	(2000) Brush-Off Blast Cleaning
SSPC SP 10	(1994) Near-White Blast Cleaning
SSPC SP 12	(1995) Surface Preparation and Cleaning of

Steel and Other Hard Materials by High-and  
Ultra high-Pressure Water Jetting Prior to  
Recoating

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1

(2003) Safety and Health Requirements  
Manual

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

The current MPI, "Approved Product List" which lists paint by brand, label, product name and product code as of the date of contract award, will be used to determine compliance with the submittal requirements of this specification. The Contractor may choose to use a subsequent MPI "Approved Product List", however, only one list may be used for the entire contract and each coating system is to be from a single manufacturer. All coats on a particular substrate must be from a single manufacturer. No variation from the MPI Approved Products List is acceptable.

Samples of specified materials may be taken and tested for compliance with specification requirements.

In keeping with the intent of Executive Order 13101, "Greening the Government through Waste Prevention, Recycling, and Federal Acquisition", products certified by SCS as meeting SCS SP01-01 shall be given preferential consideration over registered products. Products that are registered shall be given preferential consideration over products not carrying any EPP designation.

### SD-02 Shop Drawings

Piping identification

Submit color stencil codes

### SD-03 Product Data

Coating; G-AE

Manufacturer's Technical Data Sheets

### SD-04 Samples

Color; G-AE

Submit manufacturer's samples of paint colors. Cross reference color samples to color scheme as indicated.

## SD-07 Certificates

Applicator's qualifications

Qualification Testing laboratory for coatings G-AE

## SD-08 Manufacturer's Instructions

Application instructions

Mixing

Detailed mixing instructions, minimum and maximum application temperature and humidity, potlife, and curing and drying times between coats.

Manufacturer's Material Safety Data Sheets

Submit manufacturer's Material Safety Data Sheets for coatings, solvents, and other potentially hazardous materials, as defined in FED-STD-313.

## SD-10 Operation and Maintenance Data

Coatings: G-AO

Preprinted cleaning and maintenance instructions for all coating systems shall be provided.

## 1.3 APPLICATOR'S QUALIFICATIONS

## 1.3.1 SSPC QP 1 Certification

All contractors and subcontractors that perform surface preparation or coating application shall be certified by the Society for Protective Coatings (formerly Steel Structures Painting Council) (SSPC) to the requirements of SSPC QP 1 prior to contract award, and shall remain certified while accomplishing any surface preparation or coating application. The painting contractors and painting subcontractors must remain so certified for the duration of the project. If a contractor's or subcontractor's certification expires, the firm will not be allowed to perform any work until the certification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive certification will not be considered and liquidated damages will apply. Notify the Contracting Officer of any change in contractor certification status.

## 1.4 QUALITY ASSURANCE

## 1.4.1 Field Samples and Tests

The Contracting Officer may choose up to two coatings that have been delivered to the site to be tested at no cost to the Government. Take samples of each chosen product as specified in the paragraph "Sampling Procedures." Test each chosen product as specified in the paragraph "Testing Procedure." Products which do not conform, shall be removed from the job site and replaced with new products that conform to the referenced specification. Testing of replacement products that failed initial testing shall be at no cost to the Government.



#### 1.4.1.1 Sampling Procedure

The Contracting Officer will select paint at random from the products that have been delivered to the job site for sample testing. The Contractor shall provide one quart samples of the selected paint materials. The samples shall be taken in the presence of the Contracting Officer, and labeled, identifying each sample. Provide labels in accordance with the paragraph "Packaging, Labeling, and Storage" of this specification.

#### 1.4.1.2 Testing Procedure

Provide Batch Quality Conformance Testing for specified products, as defined by and performed by MPI. As an alternative to Batch Quality Conformance Testing, the Contractor may provide Qualification Testing for specified products above to the appropriate MPI product specification, using the third-party laboratory approved under the paragraph "Qualification Testing" laboratory for coatings. The qualification testing lab report shall include the backup data and summary of the test results. The summary shall list all of the reference specification requirements and the result of each test. The summary shall clearly indicate whether the tested paint meets each test requirement. Note that Qualification Testing may take 4 to 6 weeks to perform, due to the extent of testing required.

Submit name, address, telephone number, FAX number, and e-mail address of the independent third party laboratory selected to perform testing of coating samples for compliance with specification requirements. Submit documentation that laboratory is regularly engaged in testing of paint samples for conformance with specifications, and that employees performing testing are qualified. If the Contractor chooses MPI to perform the Batch Quality Conformance testing, the above submittal information is not required, only a letter is required from the Contractor stating that MPI will perform the testing.

### 1.5 REGULATORY REQUIREMENTS

#### 1.5.1 Environmental Protection

In addition to requirements specified elsewhere for environmental protection, provide coating materials that conform to the restrictions of the local Air Pollution Control District and regional jurisdiction. Notify Contracting Officer of any paint specified herein which fails to conform.

#### 1.5.2 Lead Content

Do not use coatings having a lead content over 0.06 percent by weight of nonvolatile content.

#### 1.5.3 Chromate Content

Do not use coatings containing zinc-chromate or strontium-chromate.

#### 1.5.4 Asbestos Content

Materials shall not contain asbestos.

#### 1.5.5 Mercury Content

Materials shall not contain mercury or mercury compounds.

#### 1.5.6 Silica

Abrasive blast media shall not contain free crystalline silica.

#### 1.5.7 Human Carcinogens

Materials shall not contain ACGIH 0100Doc and ACGIH 0100Doc confirmed human carcinogens (A1) or suspected human carcinogens (A2).

### 1.6 PACKAGING, LABELING, AND STORAGE

Paints shall be in sealed containers that legibly show the contract specification number, designation name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name and address of manufacturer. Pigmented paints shall be furnished in containers not larger than 5 gallons. Paints and thinners shall be stored in accordance with the manufacturer's written directions, and as a minimum, stored off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors, and at temperatures between 40 to 95 degrees F.

### 1.7 SAFETY AND HEALTH

Apply coating materials using safety methods and equipment in accordance with the following:

Work shall comply with applicable Federal, State, and local laws and regulations, and with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis as specified in Section 01400, SPECIAL SAFETY REQUIREMENT and in Appendix A of EM 385-1-1. The Activity Hazard Analysis shall include analyses of the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.

#### 1.7.1 Safety Methods Used During Coating Application

Comply with the requirements of SSPC Guide 3.

#### 1.7.2 Toxic Materials

To protect personnel from overexposure to toxic materials, conform to the most stringent guidance of:

- a. The applicable manufacturer's Material Safety Data Sheets (MSDS) or local regulation.
- b. 29 CFR 1910.1000.
- c. ACGIH 0100Doc, threshold limit values.

### 1.8 ENVIRONMENTAL CONDITIONS

#### 1.8.1 Coatings

Do not apply coating when air or substrate conditions are:

- a. Less than 5 degrees F above dew point;

- b. Below 50 degrees F or over 95 degrees F, unless specifically pre-approved by the Contracting Officer and the product manufacturer. Under no circumstances shall application conditions exceed manufacturer recommendations.

#### 1.9 COLOR SELECTION

Colors of finish coats shall be as indicated or specified. Where not indicated or specified, colors shall be selected by the Contracting Officer. Manufacturers' names and color identification are used for the purpose of color identification only. Named products are acceptable for use only if they conform to specified requirements. Products of other manufacturers are acceptable if the colors approximate colors indicated and the product conforms to specified requirements.

Tint each coat progressively darker to enable confirmation of the number of coats.

Color, texture, and pattern of wall coating systems shall be in accordance with Section 09915 COLOR SCHEDULE.

#### 1.10 LOCATION AND SURFACE TYPE TO BE PAINTED

##### 1.10.1 Painting Included

Where a space or surface is indicated to be painted, include the following unless indicated otherwise.

- a. Surfaces behind portable objects and surface mounted articles readily detachable by removal of fasteners, such as screws and bolts.
- b. New factory finished surfaces that require identification or color coding and factory finished surfaces that are damaged during performance of the work.
- c. Existing coated surfaces that are damaged during performance of the work.

##### 1.10.1.1 Exterior Painting

Includes new surfaces of the building and appurtenances.

##### 1.10.1.2 Interior Painting

Includes new surfaces of the building and appurtenances as indicated. Where a space or surface is indicated to be painted, include the following items, unless indicated otherwise.

- a. Exposed columns, girders, beams, joists, and metal deck; and
- b. Other contiguous surfaces.

##### 1.10.2 Painting Excluded

Do not paint the following unless indicated otherwise.

- a. Surfaces concealed and made inaccessible by panelboards, fixed

ductwork, machinery, and equipment fixed in place.

- b. Surfaces in concealed spaces. Concealed spaces are defined as enclosed spaces above suspended ceilings, furred spaces, elevator shafts and chases.
- c. Steel to be embedded in concrete.
- d. Copper, stainless steel, aluminum, brass, and lead except existing coated surfaces.
- e. Hardware, fittings, and other factory finished items.

#### 1.10.3 Mechanical and Electrical Painting

Includes field coating of interior and exterior new surfaces.

- a. Where a space or surface is indicated to be painted, include the following items unless indicated otherwise.
  - (1) Exposed piping, conduit, and ductwork;
  - (2) Supports, hangers, air grilles, and registers;
  - (3) Miscellaneous metalwork and insulation coverings.
- b. Do not paint the following, unless indicated otherwise:
  - (1) New zinc-coated, aluminum, and copper surfaces under insulation
  - (2) New aluminum jacket on piping
  - (3) New interior ferrous piping under insulation

##### 1.10.3.1 Fire Extinguishing Sprinkler Systems

Clean, pretreat, prime, and paint new fire extinguishing sprinkler systems including valves, piping, conduit, hangers, supports, miscellaneous metalwork, and accessories. Apply coatings to clean, dry surfaces, using clean brushes. Clean the surfaces to remove dust, dirt, rust, and loose mill scale. Immediately after cleaning, provide the metal surfaces with one coat primer per schedules. Shield sprinkler heads with protective covering while painting is in progress. Upon completion of painting, remove protective covering from sprinkler heads. Remove sprinkler heads which have been painted and replace with new sprinkler heads. Provide primed surfaces with the following:

- a. Piping in Unfinished Areas: Provide primed surfaces with one coat of red alkyd gloss enamel applied to a minimum dry film thickness of 1.0 mil in attic spaces, spaces above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, and spaces where walls or ceiling are not painted or not constructed of a prefinished material.
- b. Piping in Finished Areas: Provide primed surfaces with two coats of paint to match adjacent surfaces, except provide valves and operating accessories with one coat of red alkyd gloss enamel

applied to a minimum dry film thickness of 1.0 mil. Provide piping with 2 inch wide red enamel bands or self-adhering red plastic bands spaced at maximum of 20 foot intervals throughout the piping systems.

#### 1.10.4 Definitions and Abbreviations

##### 1.10.4.1 Qualification Testing

Qualification testing is the performance of all test requirements listed in the product specification. This testing is accomplished by MPI to qualify each product for the MPI Approved Product List, and may also be accomplished by Contractor's third party testing lab if an alternative to Batch Quality Conformance Testing by MPI is desired.

##### 1.10.4.2 Batch Quality Conformance Testing

Batch quality conformance testing determines that the product provided is the same as the product qualified to the appropriate product specification. This testing shall only be accomplished by MPI testing lab.

##### 1.10.4.3 Coating

A film or thin layer applied to a base material called a substrate. A coating may be a metal, alloy, paint, or solid/liquid suspensions on various substrates (metals, plastics, wood, paper, leather, cloth, etc.). They may be applied by electrolysis, vapor deposition, vacuum, or mechanical means such as brushing, spraying, calendaring, and roller coating. A coating may be applied for aesthetic or protective purposes or both. The term "coating" as used herein includes emulsions, enamels, stains, varnishes, sealers, epoxies, and other coatings, whether used as primer, intermediate, or finish coat. The terms paint and coating are used interchangeably.

##### 1.10.4.4 DFT or dft

Dry film thickness, the film thickness of the fully cured, dry paint or coating.

##### 1.10.4.5 DSD

Degree of Surface Degradation, the MPI system of defining degree of surface degradation. Five (5) levels are generically defined under the Assessment sections in the MPI Maintenance Repainting Manual.

##### 1.10.4.6 EPP

Environmentally Preferred Products, a standard for determining environmental preferability in support of Executive Order 13101.

##### 1.10.4.7 EXT

MPI short term designation for an exterior coating system.

##### 1.10.4.8 INT

MPI short term designation for an interior coating system.

## 1.10.4.9 micron / microns

The metric measurement for 0.001 mm or one/one-thousandth of a millimeter.

## 1.10.4.10 mil / mils

The English measurement for 0.001 in or one/one-thousandth of an inch, equal to 25.4 microns or 0.0254 mm.

## 1.10.4.11 mm

The metric measurement for millimeter, 0.001 meter or one/one-thousandth of a meter.

## 1.10.4.12 MPI Gloss Levels

MPI system of defining gloss. Seven (7) gloss levels (G1 to G7) are generically defined under the Evaluation sections of the MPI Manuals. Traditionally, Flat refers to G1/G2, Eggshell refers to G3, Semigloss refers to G5, and Gloss refers to G6.

Gloss levels are defined by MPI as follows:

Gloss Level	Description	Units @ 60 degrees	Units @ 85 degrees
G1	Matte or Flat	0 to 5	10 max
G2	Velvet	0 to 10	10 to 35
G3	Eggshell	10 to 25	10 to 35
G4	Satin	20 to 35	35 min
G5	Semi-Gloss	35 to 70	
G6	Gloss	70 to 85	
G7	High Gloss		

Gloss is tested in accordance with ASTM D 523. Historically, the Government has used Flat (G1 / G2), Eggshell (G3), Semi-Gloss (G5), and Gloss (G6).

## 1.10.4.13 MPI System Number

The MPI coating system number in each Division found in either the MPI Architectural Painting Specification Manual or the Maintenance Repainting Manual and defined as an exterior (EXT/REX) or interior system (INT/RIN). The Division number follows the CSI Master Format.

## 1.10.4.14 Paint

See Coating definition.

## 1.10.4.15 REX

MPI short term designation for an exterior coating system used in repainting projects or over existing coating systems.

## 1.10.4.16 RIN

MPI short term designation for an interior coating system used in repainting projects or over existing coating systems.

## PART 2 PRODUCTS

### 2.1 MATERIALS

Conform to the coating specifications and standards referenced in PART 3. Submit manufacturer's technical data sheets for specified coatings and solvents.

## PART 3 EXECUTION

### 3.1 PROTECTION OF AREAS AND SPACES NOT TO BE PAINTED

Prior to surface preparation and coating applications, remove, mask, or otherwise protect, hardware, hardware accessories, machined surfaces, radiator covers, plates, lighting fixtures, public and private property, and other such items not to be coated that are in contact with surfaces to be coated. Following completion of painting, workmen skilled in the trades involved shall reinstall removed items. Restore surfaces contaminated by coating materials, to original condition and repair damaged items.

### 3.2 SURFACE PREPARATION

Remove dirt, splinters, loose particles, grease, oil, and other foreign matter and substances deleterious to coating performance as specified for each substrate before application of paint or surface treatments. Oil and grease shall be removed prior to mechanical cleaning. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces. Exposed ferrous metals such as nail heads on or in contact with surfaces to be painted with water-thinned paints, shall be spot-primed with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas.

### 3.3 PREPARATION OF METAL SURFACES

#### 3.3.1 New Ferrous Surfaces

- a. Ferrous Surfaces including Shop-coated Surfaces and Small Areas That Contain Rust, Mill Scale and Other Foreign Substances: Solvent clean or detergent wash in accordance with SSPC SP 1 to remove oil and grease. Where shop coat is missing or damaged, clean according to SSPC SP 2, SSPC SP 3, SSPC SP 6, or SSPC SP 10. Shop-coated ferrous surfaces shall be protected from corrosion by treating and touching up corroded areas immediately upon detection.
- b. Surfaces With More Than 20 Percent Rust, Mill Scale, and Other Foreign Substances: Clean entire surface in accordance with SSPC SP 6/SSPC SP 12 WJ-3.
- c. Metal Floor Surfaces to Receive Nonslip Coating: Clean in accordance with SSPC SP 10.
- d. Exposed steel framing, columns, stair and railing structure scheduled to receive paint finish. Grind welded seams. Spot prepare bare metal and rusty areas according to SSPC SP 6 Commercial blast cleaning and feather edges. All surfaces shall be clean, dry and free of oil, grease and other contaminants.

### 3.3.2 Final Ferrous Surface Condition:

For tool cleaned surfaces, the requirements are stated in SSPC SP 2 and SSPC SP 3. As a visual reference, cleaned surfaces shall be similar to photographs in SSPC VIS 3.

For abrasive blast cleaned surfaces, the requirements are stated in SSPC SP 7, SSPC SP 6, and SSPC SP 10. As a visual reference, cleaned surfaces shall be similar to photographs in SSPC VIS 1.

For waterjet cleaned surfaces, the requirements are stated in SSPC SP 12. As a visual reference, cleaned surfaces shall be similar to photographs in SSPC VIS 4.

### 3.3.3 Galvanized Surfaces

- a. New or Existing Galvanized Surfaces With Only Dirt and Zinc Oxidation Products: Clean with solvent, steam, or non-alkaline detergent solution in accordance with SSPC SP 1. If the galvanized metal has been passivated or stabilized, the coating shall be completely removed by brush-off abrasive blast. New galvanized steel to be coated shall not be "passivated" or "stabilized" If the absence of hexavalent stain inhibitors is not documented, test as described in ASTM D 2092, Appendix X2, and remove by one of the methods described therein.
- b. Galvanized with Slight Coating Deterioration or with Little or No Rusting: Water jetting to SSPC SP 12 WJ3 to remove loose coating from surfaces with less than 20 percent coating deterioration and no blistering, peeling, or cracking. Use inhibitor as recommended by the coating manufacturer to prevent rusting.

### 3.3.4 Non-Ferrous Metallic Surfaces

Aluminum and aluminum-alloy, lead, copper, and other nonferrous metal surfaces.

- a. Surface Cleaning: Solvent clean in accordance with SSPC SP 1 and wash with mild non-alkaline detergent to remove dirt and water soluble contaminants.

## 3.4 PREPARATION OF CONCRETE AND CEMENTITIOUS SURFACE

### 3.4.1 Gypsum Board

- a. Surface Cleaning: Gypsum board shall be dry. Remove loose dirt and dust by brushing with a soft brush, rubbing with a dry cloth, or vacuum-cleaning prior to application of the first coat material. A damp cloth or sponge may be used if paint will be water-based.
- b. Repair of Minor Defects: Prior to painting, repair joints, cracks, holes, surface irregularities, and other minor defects with patching plaster or spackling compound and sand smooth.
- c. Allowable Moisture Content: Latex coatings may be applied to damp surfaces, but not surfaces with droplets of water. Do not apply epoxies to damp surfaces as determined by ASTM D 4263.



### 3.5 PREPARATION OF WOOD AND PLYWOOD SURFACES

#### 3.5.1 New Plywood and Wood Surfaces:

- a. Wood surfaces shall be cleaned of foreign matter.

Surface Cleaning: Surfaces shall be free from dust and other deleterious substances and in a condition approved by the Contracting Officer prior to receiving paint or other finish. Do not use water to clean uncoated wood.

- b. Moisture content of the wood shall not exceed 12 percent as measured by a moisture meter in accordance with ASTM D 4444, Method A, unless otherwise authorized.
- c. Wood surfaces adjacent to surfaces to receive water-thinned paints shall be primed and/or touched up before applying water-thinned paints.
- d. Cracks and Nailheads: Set and putty stop nailheads and putty cracks after the prime coat has dried.
- e. Cosmetic Repair of Minor Defects:

(1) Open Joints and Other Openings: Fill with whiting putty, linseed oil putty. Sand smooth after putty has dried.

(2) Checking: Where checking of the wood is present, sand the surface, wipe and apply a coat of pigmented orange shellac. Allow to dry before paint is applied.

#### 3.5.2 Interior Wood Surfaces, Stain Finish

Interior wood surfaces to receive stain shall be sanded. Oak and other open-grain wood to receive stain shall be given a coat of wood filler not less than 8 hours before the application of stain; excess filler shall be removed and the surface sanded smooth.

### 3.6 APPLICATION

#### 3.6.1 Coating Application

Painting practices shall comply with applicable federal, state and local laws enacted to insure compliance with Federal Clean Air Standards. Apply coating materials in accordance with SSPC PA 1 and manufacturer's printed application instructions. SSPC PA 1 and manufacturer's printed application instructions methods are applicable to all substrates, except as modified herein.

At the time of application, paint shall show no signs of deterioration. Uniform suspension of pigments shall be maintained during application.

Unless otherwise specified or recommended by the paint manufacturer, paint may be applied by brush, roller, or spray. Rollers for applying paints and enamels shall be of a type designed for the coating to be applied and the surface to be coated.

Paints, except water-thinned types, shall be applied only to surfaces that are completely free of moisture as determined by sight or touch.

Thoroughly work coating materials into joints, crevices, and open spaces. Special attention shall be given to insure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces.

Each coat of paint shall be applied so dry film shall be of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Hiding shall be complete.

Touch up damaged coatings before applying subsequent coats. Interior areas shall be broom clean and dust free before and during the application of coating material.

- a. Drying Time: Allow time between coats, as recommended by the coating manufacturer, to permit thorough drying, but not to present topcoat adhesion problems. Provide each coat in specified condition to receive next coat.
- b. Primers, and Intermediate Coats: Do not allow primers or intermediate coats to dry more than 30 days, or longer than recommended by manufacturer, before applying subsequent coats. Follow manufacturer's recommendations for surface preparation if primers or intermediate coats are allowed to dry longer than recommended by manufacturers of subsequent coatings. Each coat shall cover surface of preceding coat or surface completely, and there shall be a visually perceptible difference in shades of successive coats.
- c. Finished Surfaces: Provide finished surfaces free from runs, drops, ridges, waves, laps, brush marks, and variations in colors.
- d. Thermosetting Paints: Topcoats over thermosetting paints (epoxies and urethanes) should be applied within the overcoating window recommended by the manufacturer.

### 3.6.2 Mixing and Thinning of Paints

Reduce paints to proper consistency by adding fresh paint, except when thinning is mandatory to suit surface, temperature, weather conditions, application methods, or for the type of paint being used. Obtain written permission from the Contracting Officer to use thinners. The written permission shall include quantities and types of thinners to use.

When thinning is allowed, paints shall be thinned immediately prior to application with not more than 1 pint of suitable thinner per gallon. The use of thinner shall not relieve the Contractor from obtaining complete hiding, full film thickness, or required gloss. Thinning shall not cause the paint to exceed limits on volatile organic compounds. Paints of different manufacturers shall not be mixed.

### 3.6.3 Two-Component Systems

Two-component systems shall be mixed in accordance with manufacturer's instructions. Any thinning of the first coat to ensure proper penetration and sealing shall be as recommended by the manufacturer for each type of

substrate.

#### 3.6.4 Coating Systems

- a. Systems by Substrates: Apply coatings that conform to the respective specifications listed in the following Tables:

Table

Division 5. Exterior Metal, Ferrous and Non-Ferrous Paint Table  
Division 5. Interior Metal, Ferrous and Non-Ferrous Paint Table  
Division 6. Interior Wood Paint Table  
Division 9: Interior, Gypsum Board,  
Paint Table

- b. Minimum Dry Film Thickness (DFT): Apply paints, primers, varnishes, enamels, undercoats, and other coatings to a minimum dry film thickness of 1.5 mil each coat unless specified otherwise in the Tables. Coating thickness where specified, refers to the minimum dry film thickness.
- c. Coatings for Surfaces Not Specified Otherwise: Coat surfaces which have not been specified, the same as surfaces having similar conditions of exposure.
- d. Existing Surfaces Damaged During Performance of the Work, Including New Patches In Existing Surfaces: Coat surfaces with the following:
  - (1) One coat of primer.
  - (2) One coat of undercoat or intermediate coat.
  - (3) One topcoat to match adjacent surfaces.
- e. Existing Coated Surfaces To Be Painted: Apply coatings conforming to the respective specifications listed in the Tables herein, except that pretreatments, sealers and fillers need not be provided on surfaces where existing coatings are soundly adhered and in good condition. Do not omit undercoats or primers.

#### 3.7 COATING SYSTEMS FOR METAL

Apply coatings of Tables in Division 5 for Exterior and Interior.

- a. Apply specified ferrous metal primer on the same day that surface is cleaned, to surfaces that meet all specified surface preparation requirements at time of application.
- b. Inaccessible Surfaces: Prior to erection, use one coat of specified primer on metal surfaces that will be inaccessible after erection.
- c. Shop-primed Surfaces: Touch up exposed substrates and damaged coatings to protect from rusting prior to applying field primer.
- d. Surface Previously Coated with Epoxy or Urethane: Apply MPI 101, 1.5 mils DFT immediately prior to application of epoxy or urethane coatings.

- e. Pipes and Tubing: The semitransparent film applied to some pipes and tubing at the mill is not to be considered a shop coat, but shall be overcoated with the specified ferrous-metal primer prior to application of finish coats.
- f. Exposed Nails, Screws, Fasteners, and Miscellaneous Ferrous Surfaces. On surfaces to be coated with water thinned coatings, spot prime exposed nails and other ferrous metal with latex primer MPI 107.

### 3.8 COATING SYSTEMS FOR CONCRETE AND CEMENTITIOUS SUBSTRATES

Apply coatings of Tables in Division 3, 4 and 9 for Exterior and Interior.

### 3.9 COATING SYSTEMS FOR WOOD AND PLYWOOD

- a. Apply coatings of Tables in Division 6 for Interior.
- b. Prior to erection, apply two coats of specified primer to treat and prime wood and plywood surfaces which will be inaccessible after erection.
- c. Apply stains in accordance with manufacturer's printed instructions.

### 3.10 PIPING IDENTIFICATION

Piping Identification, Including Surfaces In Concealed Spaces: Provide in accordance with MIL-STD-101. Place stenciling in clearly visible locations. On piping not covered by MIL-STD-101, stencil approved names or code letters, in letters a minimum of 1/2 inch high for piping and a minimum of 2 inches high elsewhere. Stencil arrow-shaped markings on piping to indicate direction of flow using black stencil paint.

### 3.11 INSPECTION AND ACCEPTANCE

In addition to meeting previously specified requirements, demonstrate mobility of moving components, including swinging doors and cabinets for inspection by the Contracting Officer. Perform this demonstration after appropriate curing and drying times of coatings have elapsed and prior to invoicing for final payment.

### 3.12 PAINT TABLES

All DFT's are minimum values.

#### 3.12.1 EXTERIOR PAINT TABLES

DIVISION 3: EXTERIOR CONCRETE PAINT TABLE

DIVISION 5: EXTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE

STEEL / FERROUS SURFACES

A. New Steel that has been blast-cleaned to SSPC SP 6:

1. Alkyd

## STEEL / FERROUS SURFACES

New; MPI EXT 5.1D-G5 (Semigloss) /  
 Primer: Intermediate: Topcoat:  
 MPI 79 MPI 94 MPI 94  
 System DFT: 5.25 mils

## EXTERIOR GALVANIZED SURFACES

## B. New Galvanized surfaces:

1. Epoxy Primer / Waterborne Light Industrial Coating  
 MPI EXT 5.3K-G5 (Semigloss)  
 Primer: Intermediate: Topcoat:  
 MPI 101 MPI 110-G5 MPI 110-G5  
 System DFT: 5 mils

## 3.12.2 INTERIOR PAINT TABLES

## DIVISION 5: INTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE

## INTERIOR STEEL / FERROUS SURFACES

- A. Metal, Mechanical, Electrical, Fire extinguishing sprinkler systems including valves, conduit, hangers, supports, Surfaces adjacent to painted surfaces (Match surrounding finish), and miscellaneous metal items not otherwise specified except floors, hot metal surfaces, and new prefinished equipment:

1. Alkyd  
 MPI INT 5.1E-G2 (Flat)  
 Primer: Intermediate: Topcoat:  
 MPI 79 MPI 49 MPI 49  
 System DFT: 5.25 mils

## DIVISION 6: INTERIOR WOOD PAINT TABLE

- A. New plywood telephone and electronic backboards not otherwise specified:

1. Interior Latex Fire Retardant Flat Coating  
 Primer: Top Coat:  
 MPI 46 MPI 64

- B. New Wood; natural finish or stained:

1. Natural finish, oil-modified polyurethane  
 New; MPI INT 6.4J-G4  
 Primer: Intermediate: Topcoat:  
 MPI 57 MPI 57 MPI 57  
 System DFT: 4 mils

## DIVISION 9: INTERIOR GYPSUM BOARD SURFACES PAINT TABLE

- A. New Wallboard not otherwise specified:

DIVISION 9: INTERIOR GYPSUM BOARD SURFACES PAINT TABLE

1. Latex

New; MPI INT 9.2A-G3 (Eggshell)

Primer:	Intermediate:	Topcoat:
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MPI 50	MPI 52	MPI 52
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System DFT: 4 mils

-- End of Section --

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## DIVISION 09 - FINISHES

## SECTION 09915

## COLOR SCHEDULE

**08/02**

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    - 2.2.2.5 Fascia:
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  - 2.2.10.11 Electrical Panels:
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## SECTION 09915

## COLOR SCHEDULE

08/02

## PART 1 GENERAL

## 1.1 GENERAL

This section covers only the color of the exterior and interior materials and products that are exposed to view in the finished construction. The word "color" as used herein includes surface color and pattern. Requirements for quality and method of installation are covered in other appropriate sections of the specifications. Specific locations where the various materials are required are shown on the drawings. Items not designated for color in this section may be specified in other sections. When color is not designated for items, the Contractor shall propose a color for approval.

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-04 Samples

## Color Schedule; G-AE

1 set of color boards, 120 days after the Contractor is given Notice to proceed, complying with the following requirements:

- a. Color boards shall reflect all actual finish textures, patterns, and colors required for this contract.
- b. Materials shall be labeled with the finish type, manufacturer's name, pattern, and color reference.
- c. Samples shall be on size 8-1/2 by 11 inch boards with a maximum spread of size 25-1/2 by 33 inches for foldouts.
- d. Samples for this color board are required in addition to samples requested in other specification sections.
- e. Color boards shall be submitted to the following addresses:  
SLL/Leo A Daly  
730 2nd Ave. S.  
Suite 1100  
Minneapolis, MN 55402  
Attn: Phil Vogel

## PART 2 PRODUCTS

## 2.1 REFERENCE TO MANUFACTURER'S COLOR

Where color is shown as being specific to one manufacturer, an equivalent color by another manufacturer may be submitted for approval. Manufacturers and materials specified are not intended to limit the selection of equal colors from other manufacturers.

## 2.2 COLOR SCHEDULE

The color schedule lists the colors, patterns and textures required for exterior and interior finishes, including both factory applied and field applied colors.

## 2.2.1 Exterior Walls

Exterior wall colors shall apply to exterior wall surfaces including recesses at entrances and projecting vestibules. Conduit shall be painted to closely match the adjacent surface color. Wall color shall be provided to match the colors listed below.

## 2.2.1.1 Brick:

FB-1: Olson Brick; Carib, Wire cut  
FB-2: Olson Brick; Carib, Smooth

## 2.2.1.2 Colored Mortar:

M-1: To match CMU matrix color  
M-2: Prism P4140 Chestnut

## 2.2.1.3 Integrally Colored Rock, Smooth Faced, Split-Ribbed and Burnished Concrete Masonry Units:

CMU-1: Gage Brothers Concrete Products, Inc., Seashell - Burnished  
CMU-2: Anchor Block Company, #296 Sahara - Rock Faced  
CMU-3: Anchor Block Company, #296 Sahara - Smooth Faced

## 2.2.1.4 Composite Aluminum Wall Panel System

MP-1: Centria #9918 Dove Gray (exterior and interior)

## 2.2.1.5 Glass and Glazing:

Glass: Gray tint and clear as indicated on drawings.  
Ceramic Frit: Viracon "Simulated Sandblast".

## 2.2.2 Exterior Trim

Exterior trim shall be provided to match the colors listed below.

## 2.2.2.1 Steel Doors and Door Frames:

PNT-4: ICI #266 Residence Row (at Face Brick walls)

## 2.2.2.2 Pipe Guards:

PNT-6: ICI #1143 Stonewall

## 2.2.2.3 Aluminum Doors and Door Frames:

Clear anodized.

- 2.2.2.4 Aluminum Windows (mullion, muntin, trim, and sill):  
Clear anodized.
- 2.2.2.5 Fascia:  
MP-1: Centria #9918 Dove Gray
- 2.2.2.6 Overhangs:  
To match SSSMR-1
- 2.2.2.7 Caulking and Sealants:  
For Blast Retardant Windows & Opaque Panels Structural Silicone  
Sealant: Gray color to match framing system.
- 2.2.2.8 Expansion Joint and/or Covers:  
Elastomeric Face Seal.
- 2.2.2.9 Handrails; Exterior Stair:  
Handrails: Galvanized  
Stair Structure: PNT-6 ICI #1143 Stonewall
- 2.2.2.10 Signage:  
Satin finish, brushed aluminum.

#### 2.2.3 Exterior Roof

Roof color shall apply to exterior roof surfaces including sheet metal flashings and copings, mechanical units, roof trim, pipes, conduits, electrical appurtenances, and similar items. Roof color shall be provided to match the colors listed below.

- 2.2.3.1 Metal:  
SSSMR Type 1: MBCI Siliconized Polyester, Charcoal Gray  
SSSMR Type 2: MBCI Siliconized Polyester, Charcoal Gray  
SSSMR Type 3: Centria, #9989 Platinum

#### 2.2.4 Interior Floor Finishes

Flooring materials shall be provided to match the colors listed below.

- 2.2.4.1 Carpet:  
  
CPT-2: Patcraft Pattern Undercover #18454-00212, Color Eavesdrop  
CPT-1: Patcraft Pattern Classified #18446-00112, Color Operation
- 2.2.4.2 Carpet Tile:  
CPT-3: Lee's Pattern First Step #L8512, Color Stepping Stone #524  
(Walk-off)
- 2.2.4.3 Rubber Sheet Flooring  
  
RBR-1: Ecosurfaces, Pattern Ecorocks, Color Big Boulder #852
- 2.2.4.4 Rubber Stair Treads, Kick Strips, and Risers:  
RST-1: Flexco, Pattern Flextones, Style 1775, Color Charcoal #03,  
Finish Hammered
- 2.2.4.5 Sheet Linoleum Flooring  
  
LIN-1: Forbo, Marmoleum Real, Color Caribbean #3038

LIN-2: Forbo, Marmoleum Real, Color Sahara #3174  
LIN 3: Forbo, Marmoleum Fresco, Color Nomad #3868.

#### 2.2.4.6 Terrazzo Flooring

TER-1: Cream/field (custom mix, Terrazzo and Marble Supply #04-274)  
TER-2: Burgundy (custom mix, Terrazzo and Marble Supply #03-506)  
TER-3: Dark blue (custom mix, Terrazzo and Marble Supply #04-276)

#### 2.2.4.7 Terrazzo Flooring Dividers

Material: Zinc

#### 2.2.4.8 Terrazzo Tile Stair Treads

TER-1: Cream/field (custom mix Terrazzo and Marble Supply #04-274)

#### 2.2.4.9 Porcelain Tile:

PT-1: Daltile, Porcelain Graniti 8x8 floortile, Color Beige #CD31

#### 2.2.4.10 Grout:

GR-2: Laticrete, Color Antique White #23

#### 2.2.4.11 Static Dissipative Tile:

SDT-1: Forbo, Style ESD, Pattern: SD150244, Color Leventina

#### 2.2.4.12 Concrete Sealed:

SLD

#### 2.2.4.13 Solid Surface Polymer

SS-2: Corian, Color: Aurora (thresholds Toilet Room)

#### 2.2.5 Interior Base Finishes

Base materials shall be provided to match the colors listed below.

##### 2.2.5.1 Resilient Base and Moldings:

VB-1: Johnsonite vinyl base, Color Silver Grey #55  
VB-2: Johnsonite vinyl base, Color Burnt Umber #63 (Scheduling Desk Base)

##### 2.2.5.2 Porcelain Tile:

PCB-1: Daltile, Porcelain Graniti 6x8 coved, Color Beige #CD31.

##### 2.2.5.3 Wood:

WD-1: Natural Oak, Clear Finish

##### 2.2.5.4 Precast Terrazzo:

TB-1: Cream/field (Custom Mix, Terrazzo and Marble Supply #04-274)

#### 2.2.6 Interior Wall Finishes

Interior wall color shall apply to the entire wall surface, including reveals, vertical furred spaces, grilles, diffusers, electrical and access panels, and piping and conduit adjacent to wall surfaces unless otherwise specified. Items not specified in other paragraphs shall be painted to match adjacent wall surface. Wall materials shall be provided to match the

colors listed below.

- 2.2.6.1 Paint:
  - PNT-1: Benjamin Moore, Color Cream Froth #2158-70
- 2.2.6.2 Vinyl Wall Covering:
  - VWC-1: JM Lynne, Essex, Pattern Avalon, Color #SP-89-14 Ginger
  - VWC-2: JM Lynne, Essex, Pattern Avalon, Color #SP-89-16 Nutria
  - VWC-4: Sanitas, Pattern Indulgence, Color Corso Com o 3B21-93
  - VWC-5: Not used
  - VWC-6: MDC, Memerase, Pattern Whitewall, Color White #MWW-6001
- 2.2.6.3 Ceramic Tile:
  - CT-1: Daltile, Glazed 4x4 Wall Tile, Color Canvas 0137
  - CT-2: Daltile, Glazed 4x4 Wall Tile, Color Mexican Sand #K-174
  - CT-3: Daltile, Glazed 4x4 Wall Tile, Color Bombay #0170
  - CT-4: Daltile, Glazed 4x4 Wall Tile, Color Galaxy #1469
- 2.2.6.4 Ceramic Tile Grout:
  - GR-1: Laticrete, Color Bright White #44 (Toilet Rooms)

#### 2.2.7 Interior Ceiling Finishes

Ceiling colors shall apply to ceiling surfaces including soffits, furred down areas, grilles, diffusers, registers, and access panels. Ceiling color shall also apply to joist, underside of roof deck, and conduit and piping where joists and deck are exposed and required to be painted. Ceiling materials shall be provided to match the colors listed below.

- 2.2.7.1 Acoustical Tile:
  - ACT-1: Armstrong, Pattern Optima
  - ACT-2: USG, Pattern Panz, Color Clear Anodized
- 2.2.7.2 Acoustical Grid
  - ACT-1: Manufacturer's standard as specified, color as specified.
  - ACT-2: USG, DX system, Color Silver Satin 002
- 2.2.7.3 Deep Edge System:
  - USG, 6" Compasso Edge, Color Silver Satin 002
- 2.2.7.4 Paint:
  - PNT-3: Benjamin Moore, Color Superwhite (Ready Mix)
- 2.2.7.5 Metal Deck:
  - PNT-3: Benjamin Moore, Color Superwhite (Ready Mix) (Lobby)
- 2.2.7.6 Structural Framing:
  - PNT-6: ICI #1143 Stonewall (Lobby)

#### 2.2.8 Interior Trim

Interior trim shall be provided to match the colors listed below.

- 2.2.8.1 Steel Doors:
  - PNT-2: ICI #606 Song Sparrow

- 2.2.8.2 Steel Door Frames:  
PNT-2: ICI #606 Song Sparrow
- 2.2.8.3 Aluminum Doors and Door Frames:  
Clear Anodized
- 2.2.8.4 Aluminum Windows (mullion, muntin, trim, and sill):  
Vistawall #215 R1 Clear C-I
- 2.2.8.5 Wood Doors:  
WD-1: Red Oak, Clear Satin Finish
- 2.2.8.6 Window Sills:  
SS-2: Corian, Color Aurora
- 2.2.8.7 Fire Extinguisher Cabinets:  
Manufacturer's standard baked enamel white
- 2.2.8.8 Handrails:  
PNT-2: ICI #606 Song Sparrow
- 2.2.8.9 Metal Stairs:  
PNT-2: ICI #606 Song Sparrow
- 2.2.8.10 Exposed Ductwork:  
PNT-3: Benjamin Moore, Color Superwhite (Ready Mix)
- 2.2.9 Interior Window Treatment
  - 2.2.9.1 Window Shades:  
WT-1: Meccoshade Systems: Thermoveil #0910 Light Grey  
WT-2: Meccoshade Systems: Blackout Vinyl #0702 Grey
- 2.2.10 Interior Miscellaneous

Miscellaneous items shall be provided to match the colors listed below.

  - 2.2.10.1 Toilet Partitions and Urinal Screens:  
TP-1: Bobrick Beige #1530-60
  - 2.2.10.2 Plastic Laminate:  
PL-1: Nevamar, Pattern/Color Silver Alu Metalx #MXT-003T  
PL-2: Nevamar, Pattern/Color Creme Tranquility #TQ-2-1T  
PL-3: Nevamar, Pattern/Color Amazen Light #AZY-004T
  - 2.2.10.3 Solid Surfacing Material:  
SS-3: Corian, Color Acorn  
SS-4: Corian, Color Canyon
  - 2.2.10.4 Casework:  
WD-1: Red Oak, Clear Finish
  - 2.2.10.5 Signage Background Color (excluding handicapped signage):  
ICI #1486 Signature Blue
  - 2.2.10.6 Operable Partitions:  
OP-1: JM Lynne Essex, Color SP-89-23 Burnished (vinyl wallcovering #VWC-3)

2.2.10.7 Corner Guards:

CG-1: Acrovyn CO-8/SCO-8, Finish: Stainless Steel

2.2.10.8 Auditorium Seating

TMF (Metal Finish): Color Titanium, Hussey Quattro Chair

TPF (Plastic Finish): Color Titanium, Hussey Quattro Chair

PL-4 (Tablet Arm Plastic Laminate): Wilsonart #4795-60 Windswept  
Pewter, Hussey Quattro Chair

FAB-1 Upholstery: Maharam Milestone #403901, Color 055 Embrace

2.2.10.9 Wall Switch Handles and Standard Receptacle Bodies:

Gray

2.2.10.10 Electrical Device Cover Plates:

Stainless Steel

2.2.10.11 Electrical Panels:

PNT-1

2.2.10.12 Aluminum Storage Locker:

Salsbury Industries, 2214 Series, Powder Coat Silver Finish, Black  
Peripheral Trim, #2468 Engraved Door

2.2.10.13 Elevator

Interior Walls, Doors: Stainless Steel Floor

Floor: CPT-2

2.3 PLACEMENT SCHEDULE

Placement of color shall be in accordance with the Room Finish Schedules

PART 3 EXECUTION (Not Applicable)

-- End of Section --

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SECTION 10100A

VISUAL COMMUNICATIONS SPECIALTIES

07/02

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## SECTION 10100A

## VISUAL COMMUNICATIONS SPECIALTIES

07/02

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM B 221 (2002) Aluminum and Aluminum-Alloy  
Extruded Bars, Rods, Wire, Profiles, and  
Tubes

## 1.2 GENERAL REQUIREMENTS

The term visual display board when used herein includes flexible dry-erase writing surface. Visual display boards shall be from manufacturer's standard product line.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-03 Product Data

Visual Display Boards; G-AE

Manufacturer's descriptive data and catalog cuts.  
Manufacturer's installation instructions, and cleaning and  
maintenance instructions.

## SD-04 Samples

Aluminum; G-AE

Sections of frame, and chalktray.

Flexible Dry-Erase Surface

Section of material showing the lamination of vinyl wall  
covering. Samples shall be minimum 8 by 8 inches and show range  
of color.

## SD-07 Certificates

## Visual Display Boards

Certificate of compliance signed by Contractor attesting that visual display boards conform to the requirements specified.

### 1.4 DELIVERY, STORAGE AND HANDLING

Materials shall be delivered to the building site in the manufacturer's original unopened containers and shall be stored in a clean dry area with temperature maintained above 50 degrees F. Materials shall be stacked according to manufacturer's recommendations. Visual display boards shall be allowed to acclimate to the building temperature for 24 hours prior to installation.

### 1.5 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one year period shall be provided.

## PART 2 PRODUCTS

### 2.1 COLOR

Finish colors for required items shall be as specified in Section 09915 COLOR SCHEDULE.

### 2.2 MATERIALS

#### 2.2.1 Flexible Dry-Erase Surface

Dry-erase writing surface shall meet the requirements for a Type II wall covering specification. It shall be 23 mil thick, meet 160 x 160 tensile strength and 82 x 89 tear strength. It shall be available in widths as required and of unlimited length to provide a seamless writing surface, Class "A" fire rated, cadmium and mercury free, and shall not contain nor degrade to perfluorooctanic acid (PFOA). Surface must be easily cleanable and resistant to staining.

#### 2.2.2 Aluminum

Aluminum frame extrusions shall be alloy 6063-T5 or 6063-T6, conform to ASTM B 221, and be a minimum 0.06 inches thick. Exposed aluminum shall have an anodized, satin finish. Straight, single lengths shall be used wherever possible. Joints shall be kept to a minimum.

### 2.3 FLEXIBLE DRY-ERASE WRITING SURFACE

Dry erase writing surface shall be field installed with a flexible dry erase writing surface, snap-on aluminum trim and tray. Writing surface shall be installed horizontally, without seams. Trim shall be cut to length, without joints, and installed along top and side edges. Tray shall extend along full length of bottom edge. Dry-erase markings shall be removable with a felt eraser or dry cloth without ghosting. Each unit shall come complete with an eraser and four different color compatible dry-erase markers. The size shall be as shown on the drawings.

### 2.4 PROJECTION SCREEN

Recessed ceiling mount motorized projection screen shall have 120V motor

that is lubricated for life, quick reversal type, has overload protector, integral gears, and preset accessible limit switches. Recessed mount projection screens shall have an operable closure door and access panel. Screen shall be flame retardant, mildew resistant, and white matte with black masking borders. Bottom of screen fabric shall be weighted with metal rod. Roller shall be a rigid metal at least 3 inches in diameter mounted on sound absorbing supports. Motor will be motor-in-roller design.

Screen shall have a 3 position control switch to stop or reverse screen at any point. The switch shall be installed in a flush electrical box with cover plate, location(s) as shown on the electrical drawings. All conduit and wiring from the control switch to the projection screen shall be furnished and installed by the Contractor. Ceiling recessed case shall be extruded aluminum. Screen shall be UL listed. The size of all screens shall be 8 feet wide by 8 feet high in locations shown on drawings.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Installation and assembly shall be in accordance with manufacturer's printed instructions. Concealed fasteners shall be used. Visual display boards shall be attached to the walls with suitable devices to anchor each unit. The Contractor shall furnish and install trim items, accessories and miscellaneous items in total, including but not limited to hardware, grounds, clips, backing materials, adhesives, brackets, and anchorages incidental to or necessary for a sound, secure, complete and finished installation. Installation shall not be initiated until completion of room painting and finishing operations. Visual display boards shall be installed in locations and at mounting heights indicated. Visual display boards shall be installed level and plumb, and if applicable doors shall be aligned and hardware shall be adjusted. Damaged materials shall be repaired or replaced by the Contractor as directed by the Contracting Officer.

#### 3.2 CLEANING

Writing surfaces shall be cleaned in accordance with manufacturer's instructions. Projection screens and exposed housing surfaces shall be cleaned in accordance with manufacturer's instructions.

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SECTION 10153

TOILET PARTITIONS

11/03

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- 1.4 DELIVERY, STORAGE, AND HANDLING
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## SECTION 10153

## TOILET PARTITIONS

11/03

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

36 CFR 1191

Americans with Disabilities Act (ADA)  
Accessibility Guidelines for Buildings and  
Facilities

## U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-60003

(Basic) Partitions, Toilet, Complete

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-02 Shop Drawings

Toilet Enclosures; G-AE

Urinal Screens; G-AE

Hardware; G-AE

Installation; G-AE

Drawings showing plans, elevations, details of construction,  
hardware, reinforcing, fittings, mountings, and anchorings.

## SD-03 Product Data

Toilet Enclosures; G-AE

Urinal Screens; G-AE

Hardware; G-AE

Toilet Partition System

Manufacturer's technical data and catalog cuts including

installation and cleaning instructions.

#### SD-04 Samples

Colors and Finishes; G-AE

Manufacturer's standard color charts and color samples.

### 1.3 SYSTEM DESCRIPTION

Toilet partition system, including toilet enclosures, room entrance screens, and urinal screens, shall be a complete and usable system of panels, hardware, and support components. The Contractor shall comply with EPA requirements in accordance with Section 01670 RECYCLED / RECOVERED MATERIALS. The partition system shall be provided by a single manufacturer, and shall be a standard product as shown in the most recent catalog data. The partition system shall be as shown.

### 1.4 DELIVERY, STORAGE, AND HANDLING

Components shall be delivered to the jobsite in the manufacturer's original packaging with the brand, item identification, and project reference clearly marked. Components shall be stored in a dry location that is adequately ventilated; free from dust, water, or other contaminants; and shall have easy access for inspection and handling.

### 1.5 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period shall be provided.

## PART 2 PRODUCTS

### 2.1 TOILET ENCLOSURES

Toilet enclosures shall conform to CID A-A-60003, Type I, Style C, overhead braced. Width, length, and height of toilet enclosures shall be as shown. Finish surface of panels shall be solidly fused plastic laminate with matte finish melamine surfaces integrally bonded to black phenolic-resin core. Panels indicated to receive toilet paper holders or grab bars as specified in Section 10800 TOILET ACCESSORIES, shall be prepared for mounting of the items required. Grab bars shall withstand a bending stress, shear stress, shear force, and a tensile force induced by 250 lbf. Grab bars shall not rotate within their fittings.

### 2.2 URINAL SCREENS

Urinal screens shall conform to CID A-A-60003, Type III, Style A wall mounted. Finish surface of screens shall be solidly fused plastic laminate with matte finish melamine surfaces integrally bonded to black plastic phenolic-resin core. Width and height of urinal screens shall be as shown. Secure wall hung urinal screens with 42 inch long, continuous flanges.

### 2.3 HARDWARE

Hardware for the toilet partition system shall conform to CID A-A-60003 for the specified type and style of partitions. Hardware finish shall be highly resistant to alkalies, urine, and other common toilet room acids. Latching devices and hinges for handicap compartments shall comply with 36

CFR 1191 and shall be cast aluminum or stainless steel door latches that operate without either tight grasping or twisting of the wrist of the operator. Coat hooks shall be provided at the inside of each toilet partition door.

## 2.4 COLORS AND FINISHES

### 2.4.1 Colors

Color of finishes for toilet partition system components shall be as specified in Section 09915 COLOR SCHEDULE.

### 2.4.2 Finishes

Partitions, panels and doors fabricated of solid phenolic core with melamine facing sheets formed under high pressure rendering a single component section not less than 1/2 inch thick for panels and 3/4 inch thick for doors and pilasters. Exposed finish surfaces shall be smooth, waterproof, non-absorbant, and resistant to staining and marking with pens, pencils, or other writing devices. Solid phenolic partitions shall not show any sign of deterioration when placed in contact with the following chemicals:

#### Acids

1. Nitric Acid (all concentrations)\*\*
2. Glacial Acetic Acid 99% (concentrated)
3. Sulfuric Acid (all concentrations)\*\*
4. Hydrochloric Acid (all concentrations)
5. Phosphoric Acid (all concentrations)
6. Formic Acid (all concentrations)
7. Acetic Acid (all concentrations)
8. Hydrofluoric Acid 48% (concentrated)\*
9. Aqua Regia
10. Chromic Trioxide (Chromic Acid Cleaning Solution)\*
11. Perchloric Acid (concentrated)
12. Picric Acid 1.2% (0.05M)
13. Tannic Acid (sat.)
14. Uric Acid (sat.)

#### Solvents

15. Carbon Tetrachloride
16. Carbon Disulfide
17. Acetone
18. Formaldehyde
19. Methanol
20. Ethyl Acetate
21. Toluene
22. n-Hexane
23. Ethyl Alcohol
24. Chloroform
25. Phenol (all concentrations)\*
26. EDTA
27. Xylene
28. Butyl Alcohol
29. Amyl Alcohol
30. Amyl Acetate
31. Cresol
32. Dioxane
33. Trichloroethane



34. Chlorobenzene
35. Dimethylformamide
36. Methylene Chloride
37. Methyl Ethyl Ketons
38. Naphthalene
39. Tetrahydrofuran

#### Bases

40. Sodium Hydroxide (all concentrations)
41. Sodium Sulfide 15%
42. Ammonium Hydroxide (all concentrations)

#### General Reagents

43. Sodium Hypochlorite 5%
44. Calcium Hypochlorite (concentrated)
45. Hydrogen Peroxide 3%
46. Trisodium Phosphate 30%
47. Sodium Thiocyanate
48. Zinc Chloride
49. Lactated Ringers
50. Sucrose 50%
51. Gasoline
52. Kerosene
53. Mineral Oil
54. Vegetable Oils
55. Water
56. Sodium Chromate
57. Potassium Permanganate
58. Silver Nitrate
59. Formalin
60. Benedicts Solution
61. Phosphate Buffered Saline (PBS)
62. Copper Sulfate
63. Petroleum Jelly
64. Aluminon
65. Ethylene Glycol
66. Pine Oil
67. Methyl Methacrylate
68. Alconox (Lab. Detergent)
69. Karl Fisher Reagent
70. Urea
71. Naphtha
72. Cellosolve
73. Ammonium Phosphate
74. Iodine
75. Povidone Iodine
76. Tincture of Mercurchrome
77. Tincture of Iodine
78. Tincture of Merthiolate
79. Eucalyptol
80. Procaine
81. Zephiran Chloride
82. Zinc Oxide Ointment
83. Lysol
84. Aromatic Ammonia
85. Thymol & Alcohol
86. Camphorated para-chlorophenol\*
87. Quaternary Ammonia Compounds
88. Monsel's Solution (Ferric Subsulfate)

## 89. Sodium Azide

## Stains and Indicators

90. Bromolthymol Blue
91. Phenolphthalein
92. Methyl Red
93. Methyl Orange
94. Ag Eosin Bluish 5% in Alcohol
95. Gentian Violet 1%
96. Wright's Blood Stain
97. Methylene Blue
98. Sudan III
99. Nigrosine
100. Crystal Violet
101. Malachite Green
102. Crestoi Red
103. Gram Stains
104. Safranin O
105. Thymoi Blue

Test Procedures: Listed materials placed in contact with surface under 1" (25.4mm) diameter watch cover glass for 16 hours duration prior to evaluation for effect.

\* Causes slight change of gloss or color.

\*\* Causes slight damage, with degree of damage proportionate to length of exposure and concentration. Other items leave no effect.

## PART 3 EXECUTION

## 3.1 INSTALLATION

Toilet enclosure partitions and urinal screens shall be installed straight and plumb with uniform clearance of 1/2 inch between pilasters and panels; 1 inch between pilasters and walls; and not more than 3/16 inch between pilasters and doors, in accordance with approved manufacturer's instructions with horizontal lines level and rigidly anchored to the supporting construction. Where indicated, anchorage to walls shall be by toggle-bolting. Drilling and cutting for installation of anchors shall be at locations that will be concealed in the finished work. In the finished work, conceal evidence of drilling in floors and walls. Screws and bolts shall be stainless steel.

## 3.2 ADJUSTING AND CLEANING

Adjust all operating hardware including toilet enclosure partition doors, hinges and latches to function without binding. Doors shall have a uniform vertical edge clearance of approximately 3/16 inch and shall rest open at approximately 30 degrees when unlatched. Baked enamel finish shall be touched up with the same color of paint that was used for the finish. Toilet partitions shall be cleaned in accordance with approved manufacturer's instructions and shall be protected from damage until accepted.

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SECTION 10201N

METAL WALL LOUVERS

09/99

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## SECTION 10201N

## METAL WALL LOUVERS

09/99

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## ALUMINUM ASSOCIATION (AA)

AA DAF-45 (1997) Designation System for Aluminum Finishes

## AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)

AMCA 500 (1991) Louvers, Dampers and Shutters

AMCA 511 (1991) Certified Ratings Program for Air Control Devices

## ASTM INTERNATIONAL (ASTM)

ASTM B 209 (2002a) Aluminum and Aluminum-Alloy Sheet and Plate

ASTM B 221 (2002) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

## 1.2 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

## SD-02 Shop Drawings

Wall louvers; G-AE

Show all information necessary for fabrication and installation of louvers. Indicate materials, sizes, thicknesses, fastenings, and profiles.

## SD-03 Product Data

Wall Louvers; G-AE

Expanded Metal Security Screens; G-AE

Manufacturer's literature including performance data.

## SD-04 Samples

## Wall louvers

Colors of finishes shall closely approximate colors indicated.

### 1.3 DELIVERY, STORAGE, AND PROTECTION

Deliver materials to the site in an undamaged condition. Carefully store materials off the ground to provide proper ventilation, drainage, and protection against dampness. Louvers shall be free from nicks, scratches, and blemishes. Replace defective or damaged materials with new.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Aluminum Sheet

ASTM B 209, alloy 3003 or 5005 with temper as required for forming.

#### 2.1.2 Extruded Aluminum

ASTM B 221, alloy 6063-T5 or -T52.

### 2.2 METAL WALL LOUVERS

Weather resistant type made to withstand a wind load as shown on the contract drawings. Wall louvers shall bear the AMCA certified ratings program seal for air performance and water penetration in accordance with AMCA 500 and AMCA 511. The rating shall show a water penetration of 0.20 or less ounce per square foot of free area at a free velocity of 480 feet per minute.

#### 2.2.1 Extruded Aluminum Louvers

Fabricated of extruded 6063-T5 or -T52 aluminum with a wall thickness of not less than 0.081 inch.

#### 2.2.2 Mullions and Mullion Covers

Same material and finish as louvers. Provide mullions where indicated. Provide mullions covers on both faces of joints between louvers.

#### 2.2.3 Bird Screens and Frames

For relief and exhaust aluminum louvers, provide 1/2 inch square mesh, 14 or 16 gage aluminum bird screening. Mount screens in removable, rewirable frames of same material and finish as the louvers.

#### 2.2.4 Expanded Metal Security Screens

For fresh air intakes, provide security screens formed of 16 gauge minimum hot dipped galvanized expanded metal fabricated with 18 gauge minimum, 1 inch wide U-edging. Expanded metal pattern shall be diamond shaped with 1 inch maximum opening dimension. Factory paint screens and edging, color shall be as specified in Section 09915 COLOR SCHEDULE. Install screens to the outside face of louver frames as indicated on drawings.

## 2.3 FASTENERS AND ACCESSORIES

Provide stainless steel screws and fasteners for aluminum louvers . Provide other accessories as required for complete and proper installation.

## 2.4 FINISHES

### 2.4.1 Aluminum

Provide factory-applied anodic coating.

#### 2.4.1.1 Anodic Coating

Clean exposed aluminum surfaces and apply an anodized finish conforming to AA DAF-45 Designation System for Aluminum Finishes, shall be as specified in Section 09915 COLOR SCHEDULE integral color anodized, M10C22A32, Architectural Class II, colors.

## PART 3 EXECUTION

### 3.1 INSTALLATION

#### 3.1.1 Wall Louvers

Install using strap anchors or jamb fasteners as appropriate for the wall construction and in accordance with manufacturer's recommendations.

#### 3.1.2 Screens and Frames

Attach frames to louvers with screws or bolts.

### 3.2 PROTECTION FROM CONTACT OF DISSIMILAR MATERIALS

#### 3.2.1 Copper or Copper-Bearing Alloys

Paint copper or copper-bearing alloys in contact with dissimilar metal with heavy-bodied bituminous paint or separate with inert membrane.

#### 3.2.2 Aluminum

Where aluminum contacts metal other than zinc, paint the dissimilar metal with a primer and two coats of aluminum paint.

#### 3.2.3 Metal

Paint metal in contact with mortar, concrete, or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint.

#### 3.2.4 Wood

Paint wood or other absorptive materials that may become repeatedly wet and in contact with metal with two coats of aluminum paint or a coat of heavy-bodied bituminous paint.

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SECTION 10260

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10/03

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## SECTION 10260

## CORNER GUARDS

**10/03**

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM D 1308	(2002) Effect of Household Chemicals on Clear and Pigmented Organic Finishes
ASTM D 256	(2000e1) Determining the IZOD Pendulum Impact Resistance of Plastics
ASTM D 635	(1998) Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position
ASTM E 84	(2001) Surface Burning Characteristics of Building Materials
ASTM G 21	(1996; R 2002) Determining Resistance of Synthetic Polymeric Materials to Fungi
ASTM G 22	(1976; R 1996) Determining Resistance of Plastics to Bacteria

## SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE J1545	(1986) Instrumental Color Difference Measurement for Exterior Finishes, Textiles and Colored Trim
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## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-02 Shop Drawings

## Corner Guards; G-AE

Drawings indicating locations and typical elevations of each type of item. Drawings shall show vertical and horizontal dimensions, full size sections, thickness of materials, and



fastening details.

SD-03 Product Data

Corner Guards; G-AE

Manufacturer's descriptive data, catalog cuts, installation instructions, and recommended cleaning instructions.

SD-04 Samples

Finish; G-AE

Submit three samples indicating color and texture of materials requiring color and finish.

SD-06 Test Reports

Corner Guards; G-AE

Fire rating and extinguishing test results for resilient material.

SD-07 Certificates

Corner Guards

Statements attesting that the items comply with specified fire and safety code requirements.

1.3 DELIVERY AND STORAGE

Materials shall be delivered to the project site in manufacturer's original unopened containers with seals unbroken and labels and trademarks intact. Materials shall be kept dry, protected from weather and damage, and stored under cover. Materials shall be stored at approximately 70 degrees F for at least 48 hours prior to installation.

1.4 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period shall be provided.

PART 2 PRODUCTS

2.1 GENERAL

To the maximum extent possible, corner guards shall be the standard products of a single manufacturer and shall be furnished as detailed. Drawings show general configuration of products required, and items differing in minor details from those shown will be acceptable.

2.1.1 Resilient Material

Resilient material shall consist of high impact resistant extruded acrylic vinyl, polyvinyl chloride, or injection molded thermal plastic and shall conform to the following:

#### 2.1.1.1 Minimum Impact Resistance

Minimum impact resistance shall be 18 ft. lbs/sq. inch when tested in accordance with ASTM D 256, (Izod impact, ft. lbs per sq inch notched).

#### 2.1.1.2 Fire Rating

Fire rating shall be Class 1 when tested in accordance with ASTM E 84, having a maximum flame spread of 25 and a smoke developed rating of 450 or less. Material shall be rated self extinguishing when tested in accordance with ASTM D 635. Material shall be labeled and tested by an approved nationally known testing laboratory.

#### 2.1.1.3 Integral Color

Colored components shall have integral color and shall be matched in accordance with SAE J1545 to within plus or minus 1.0 on the CIE-LCH scales.

#### 2.1.1.4 Chemical and Stain Resistance

Materials shall be resistant to chemicals and stains reagents in accordance with ASTM D 1308.

#### 2.1.1.5 Fungal and Bacterial Resistance

Materials shall be resistant to fungi and bacteria in accordance with ASTM G 21 or ASTM G 22, as applicable.

### 2.2 CORNER GUARDS

#### 2.2.1 Resilient Corner Guards

Corner guard units shall be surface mounted type, radius formed to profile shown. Corner guards shall be 4 feet high with 2 inch legs. Mounting hardware, cushions, and base plates shall be furnished. Assembly shall consist of a snap-on corner guard formed from high impact resistant resilient material, minimum 0.078 inch thick, mounted on a continuous vinyl regrind retainer. Vinyl regrind retainers shall be 100% recycled vinyl acrylic compound.

### 2.3 TRIM, FASTENERS AND ANCHORS

Vinyl trim, fasteners and anchors shall be provided for each specific installation as shown.

### 2.4 FINISH

#### 2.4.1 Resilient Material Finish

Finish for resilient material shall be embossed pebble grain texture with colors in accordance with SAE J1545.

### 2.5 ADHESIVES

Adhesive for resilient material shall be in accordance with manufacturers recommendations.

## 2.6 COLOR

Color shall be in accordance with Section 09915 COLOR SCHEDULE.

## PART 3 EXECUTION

### 3.1 INSTALLATION

#### 3.1.1 Corner Guards

Material shall be mounted at location indicated in accordance with manufacturer's recommendations. Mount bottom of corner guards flush with top of wall base.

-- End of Section --

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SECTION 10270A

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## SECTION 10270A

RAISED FLOOR SYSTEM  
10/03

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## CEILINGS &amp; INTERIOR SYSTEMS CONSTRUCTION ASSOCIATION (CISCA)

CISCA Access Floors (1987) Test Procedures for Access Floors

## INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO)

ICBO UBC (1997) Uniform Building Code (3 Vol.)

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 75 (1999) Protection of Electronic  
Computer/Data Processing Equipment

NFPA 99 (2002) Health Care Facilities

## 1.2 SYSTEM DESCRIPTION

Raised flooring shall be installed at the location and elevation and in the arrangement shown on the drawings. The floor system shall be of the stringer type, complete with all supplemental items, and shall be the standard product of a manufacturer specializing in the manufacture of raised floor systems. Floor system shall be field installed with factory installed specified floor covering.

## 1.2.1 Floor Panels

Floor panel testing shall be conducted in accordance with CISCA Access Floors. When tested as specified, all deflection and deformation measurements shall be made at the point of load application on the top surface of the panel. Floor panels shall be capable of supporting 1000 pounds per square inch concentrated load without deflecting more than 0.080 inch and without permanent deformation in excess of 0.010 inch in any of the specified tests. Floor panels shall be capable of supporting 250 pounds per square foot uniform live load without deflection more than 0.040 inch. In accordance with CISCA Access Floors, the permanent deformation limit under rolling load shall be satisfied in all of the specified tests. In the specified tests, the permanent deformation shall be measured after 10 passes with Wheel 1 and after 10,000 passes with Wheel 2.

### 1.2.2 Stringers

Stringers shall be capable of supporting a 250 pound concentrated load at midspan without permanent deformation in excess of 0.010 inch.

### 1.2.3 Pedestals

Pedestals shall be capable of supporting a 5000 pound axial load without permanent deformation.

### 1.2.4 Pedestal Adhesive

Adhesive shall be capable of securing a pedestal in place with sufficient bonding strength to resist an overturning force of 1000 inch pounds.

### 1.2.5 Bond Strength of Factory Installed Floor Covering

Bond strength of floor covering shall be sufficient to permit handling of the panels by use of the panel lifting device, and to withstand moving caster loads up to 1000 pounds, without separation of the covering from the panel.

### 1.2.6 Leakage

When the space below the finished floor is to be an air plenum, air leakage through the joints between panels and around the perimeter of the floor system shall not exceed 0.1 cubic foot of air per minute per linear foot of joint subjected to 0.1 inch, water gauge, positive pressure in the plenum.

### 1.2.7 Grounding

The raised floor system shall be grounded for safety hazard and static suppression. Ensure grounding continuity between raised flooring material and raised flooring support system.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

Raised Floor System; G-AE

Drawings showing layout of the work, sizes and details of components, details at floor perimeter, bracing to resist seismic or other lateral loads, typical cutout details including size and shape limitation, method of grounding, description of shop coating, and installation height above structural floor.

#### SD-03 Product Data

Raised Floor System; G-AE

Manufacturer's descriptive data, catalog cuts, and installation



instructions. The data shall include information about any design and production techniques, procedures and policies used to conserve energy, reduce material, improve waste management or incorporate green building/recycled products into the manufacturer of their components or products. Cleaning and maintenance instructions shall be included. Design calculations which demonstrate that the proposed floor system meets requirements for seismic loading, prepared in accordance with subparagraph Underfloor Bracing under paragraph PANEL SUPPORT SYSTEM and ICBO UBC. Certified copies of test reports may be submitted in lieu of calculations.

#### SD-04 Samples

Raised Floor System; G-AE

One sample of each panel type and suspension system proposed for use, complete with specified flooring.

#### SD-06 Test Reports

Tests; G-AO

Testing of Electrical Resistance; G-AO

Certified copies of test reports from an approved testing laboratory, attesting that the proposed floor system components meet the performance requirements specified.

#### SD-07 Certificates

Raised Floor System; G-AE

Certificate of compliance attesting that the raised floor system meets specification requirements.

### 1.4 DELIVERY, STORAGE, AND HANDLING

Materials shall be stored in original protective packaging in a safe, dry, and clean location and shall be handled in a manner to prevent damage. Panels shall be stored at temperatures between 40 and 90 degrees F, and between 20 percent and 70 percent humidity.

### 1.5 EXTRA MATERIALS

Spare floor panels, spare complete pedestal assemblies, and spare stringers shall be furnished at the rate of one space for each 100 or fraction thereof required.

### 1.6 OPERATION AND MAINTENANCE MANUALS

Provide maintenance instructions for proper care of the floor panel surface. When conductive flooring is specified, require submittal of maintenance instructions to identify special cleaning and maintenance requirements to maintain "conductivity" properties of the panel finish.

## PART 2 PRODUCTS

## 2.1 FLOOR PANELS

## 2.1.1 Panel Construction

Except for edge panels, panel size shall be 24 by 24 inches. Finished panels shall be within a 0.010 inch tolerance of the nominal size, and shall be square within a tolerance of 0.015 inch measured corner-to-corner. The top surface of panels shall be flat within a 0.020 inch tolerance measured corner-to-corner. Panels shall be permanently marked to indicate load rating and model number.

## 2.1.1.1 Aluminum Panels

Aluminum panels shall be of die-cast or extruded construction.

## 2.1.1.2 Hollow Formed Steel Panels

Steel panels shall be of die-formed construction, consisting of a flat steel top sheet welded to one or more formed steel stiffener sheets. Panels shall be chemically cleaned, bonderized, and painted with the manufacturer's standard finish.

## 2.1.2 Floor Covering

Floor panels shall be surfaced with factory installed materials firmly bonded in place with waterproof adhesive. The electrical resistance shall remain stable over the life expectancy of the floor covering. Any antistatic agent used in the manufacturing process shall be an integral part of the material, and shall not be surface applied. Bolt heads or similar attachments shall not rise above the traffic surface.

## 2.1.2.1 Electrostatic Conductive Tile

Electrostatic conductive tile flooring shall consist of solid, homogeneous construction cut from molded vinyl block with through color and pattern.

Gauge: .080 inches

Size: 24 inches by 24 inches

Factory cut edges and openings.

Electrical Resistance:  $2.5 \times 10^4$  to  $1 \times 10^6$ .

## 2.1.2.2 Electrostatic Conductive Tile Adhesive

Provide electrostatic conductive tile flooring systems manufacturers adhesive designed for system. Adhesive and its application shall maintain electrostatic conductive qualities.

## 2.1.3 Edge Strip

Panels shall be edged with extruded vinyl edge strips secured in place with mechanical interlock or adhesive bond, or shall be of a replaceable type. Top of strip shall be approximately 1/8 inch wide, and shall be flush with the floor surfacing.

## 2.1.4 Accessories

Perforated panels with dampers shall be provided where indicated, and shall be the manufacturer's standard type. Perforated panels shall be designed

to support the same static loads as floor panels without structural failure, and shall be capable of delivering the air volumes indicated. Perforated panels shall be 25 percent open area and shall be equipped with adjustable dampers. Provide 50 perforated panels with dampers.

#### 2.1.5 Resilient Base

Base shall be vinylcoved style (installed with resilient flooring). Base shall be 4 inches high and a minimum 1/8 inch thick. Preformed outside corners shall be furnished.

#### 2.1.6 Lifting Device

Each individual room shall be provided with one floor panel lifting device standard with the floor manufacturer. A minimum of two devices shall be furnished.

### 2.2 PANEL SUPPORT SYSTEM

#### 2.2.1 Pedestals

Pedestals shall be of steel or aluminum or a combination thereof. Ferrous materials shall have a factory-applied corrosion-resistant finish. Pedestal base plates shall provide a minimum of 16 square inches of bearing surface and shall be a minimum of 1/8 inch thick. Pedestal shafts shall be threaded to permit height adjustment within a range of approximately 2 inches, to permit overall floor adjustment within plus or minus 0.10 inch of the required elevation, and to permit leveling of the finished floor surface within 0.062 inch in 10 feet in all directions. Locking devices shall be provided to positively lock the final pedestal vertical adjustments in place. Pedestal caps shall interlock with panels or stringers to preclude tilting or rocking of the panels.

#### 2.2.2 Stringers

Stringers shall be of rolled steel or extruded aluminum, and shall interlock with the pedestal heads to prevent lateral movement.

### 2.3 TESTS

Raised flooring shall be factory tested by an independent laboratory at the same position and maximum design elevation and in the same arrangement as shown on the drawings for installation so as to duplicate service conditions as much as possible.

#### 2.3.1 Load Tests

Floor panel, stringer, and pedestal testing shall be conducted in accordance with CISCA Access Floors.

### 2.4 Test for Bond Strength of Factory Installed Floor Covering

The test panel shall be supported on pedestals and stringers as specified for the installed floor. The supports shall be braced as necessary to prevent sideways movement during the test. A test load of 1000 pounds shall be imposed on the test assembly through a hard plastic caster 3 inches in diameter and 1 inch wide. The caster shall be rolled completely across the center of the panel. The panel shall withstand 20 passes of the caster with no delamination or separation of the covering.

## 2.5 COLOR

Color shall be in accordance with Section 09915 COLOR SCHEDULE.

## PART 3 EXECUTION

### 3.1 INSTALLATION

The raised floor system with factory installed floor covering shall be installed in accordance with the manufacturer's instructions and with the approved detail drawings. Areas to receive raised flooring shall be maintained between 60 and 90 degrees F, and between 20 percent and 70 percent humidity for 24 hours prior to and during installation.

#### 3.1.1 Preparation for Installation

The area in which the raised floor system is to be installed shall be cleared of all debris. Structural floor surfaces shall be thoroughly cleaned and all dust shall be removed. Floor coatings required for dust or vapor control shall be installed prior to installation of pedestals only if the pedestal adhesive will not damage the coating. If the coating and adhesive are not compatible, the coating shall be applied after the pedestals have been installed and the adhesive has cured.

#### 3.1.2 Pedestals

Pedestals shall be accurately spaced, and shall be set plumb and in true alignment. Base plates shall be in full and firm contact with the structural floor, and shall be secured to the structural floor with adhesive.

#### 3.1.3 Stringers

Stringers shall be interlocked with the pedestal caps to preclude lateral movement, and shall be spaced uniformly in parallel lines at the indicated elevation.

#### 3.1.4 Auxiliary Framing

Auxiliary framing or pedestals shall be provided beneath panels that are substantially cut to accommodate utility systems.

#### 3.1.5 Panels

The panels shall be interlocked with supports in a manner that will preclude lateral movement. Perimeter cutout panels must be fastened to the supporting components to form a rigid boundary for the interior panels. Floors shall be level within 1/16 inch measured with a 10 foot straightedge in all directions. Extruded vinyl edging shall be secured in place at all cut edges of all panel cut-outs to prevent abrasion of cables.

#### 3.1.6 Resilient Base

Base shall be provided at vertical wall intersections. Cracks and voids in walls and other vertical surfaces to receive base shall be filled with an approved filler. The base shall be applied after the floor system has been completely installed. Base shall be applied with adhesive in accordance

with the manufacturer's recommendations.

### 3.1.7 Repair of Zinc Coating

Zinc coating that has been damaged, and cut edges of zinc-coated components and accessories, shall be repaired by the application of a galvanizing repair paint. Areas to be repaired shall be thoroughly cleaned prior to application of the paint.

## 3.2 TESTING OF ELECTRICAL RESISTANCE

Testing of electrical resistance in the completed installation shall be conducted in the presence of the Contracting Officer. Testing shall be in accordance with NFPA 99 modified by placing one electrode on the center of the panel surface and connecting the other electrode to the metal flooring support. Measurements shall be made at five or more locations. Each measurement shall be the average of five readings of 15 seconds duration at each location. During the tests, relative humidity shall be 45 to 55 percent and temperature shall be 69 to 75 degrees F. The panels used in the testing will be selected at random and will include two panels most distant from the ground connection. Electrical resistance shall be measured with instruments that are accurate within 2 percent and that have been calibrated within 60 days prior to the performance of the resistance tests. The metal-to-metal resistance from panel to supporting pedestal shall not exceed 10 ohms. The resistance between the wearing surface of the floor covering and the ground connection, as measured on the completed installation, shall be in accordance with paragraph FLOOR COVERING.

## 3.3 CLEANING AND PROTECTION

### 3.3.1 Cleaning

The space below the completed raised floor system shall be free of all debris. Before any traffic or other work on the completed raised floor is started, the completed floor shall be cleaned in accordance with the floor covering manufacturer's instructions.

### 3.3.2 Protection

Traffic areas of the raised floor system shall be protected with a covering of building paper, fiberboard, or other suitable material to prevent damage to the surface. Cutouts shall be covered with material of sufficient strength to support the loads to be encountered. Plywood or similar material shall be placed on the floor to serve as runways for installation of heavy equipment. Protection shall be maintained until the raised floor system is accepted.

## 3.4 FIRE SAFETY

An automatic detection system shall be installed below the raised floor system meeting the requirements of NFPA 75 paragraph 5-2.1 and shall sound an audible and visual alarm.

-- End of Section --

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## SECTION 10430

## EXTERIOR SIGNAGE

**11/03**

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic the designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM B 26/B 26M (2002) Aluminum-Alloy Sand Castings

ASTM B 108 (2001a) Aluminum-Alloy Permanent Mold Castings

## AMERICAN WELDING SOCIETY (AWS)

AWS C1.1M/C1.1 (2000) Resistance Welding of Carbon and Low-Alloy Steels

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-02 Shop Drawings

## Approved Detail Drawings; G-AE

Drawings showing elevations of each type of exterior signage; dimensions, details, and methods of mounting or anchoring in masonry construction; shape and thickness of materials; and details of construction. A schedule showing the location, each sign type, and message shall be included.

## SD-03 Product Data

## Dimensional Building Letters

Manufacturer's descriptive data and catalog cuts.

## Installation

Manufacturer's installation instructions and cleaning instructions.



## SD-04 Samples

Exterior Signage Dimensional Building Letters; G-AE

One sample cast aluminum letter. Samples may be installed in the work, provided each sample is identified and location recorded.

## SD-10 Operation and Maintenance Data

Protection and Cleaning; G-AO

Six copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. The instructions shall include simplified diagrams for the equipment as installed.

## 1.3 GENERAL

All exterior signage shall be provided by a single manufacturer. Exterior signage shall be of the design, detail, sizes, types, and message content shown on the drawings, shall conform to the requirements specified, and shall be provided at the locations indicated. Signs shall be complete with lettering and related components for a complete installation. Recyclable materials shall conform to EPA requirements in accordance with Section 01670 RECYCLED / RECOVERED MATERIALS.

## 1.4 CHARACTER PROPORTIONS AND HEIGHTS

Letters and numbers on indicated signs for handicapped-accessible buildings shall have a width-to-height ratio between 3:5 and 1:1 and a stroke-width-to-height ratio between 1:5 and 1:10. Characters and numbers on indicated signs shall be sized according to the viewing distance from which they are to be read. The minimum height is measured using an upper case letter "X". Lower case characters are not permitted.

## 1.5 QUALIFICATIONS

Signs, plaques, and dimensional letters shall be the standard product of a manufacturer regularly engaged in the manufacture of the products. Items of equipment shall essentially duplicate equipment that has been in satisfactory use at least 2 years prior to bid opening.

## 1.6 DELIVERY AND STORAGE

Materials shall be wrapped for shipment and storage, delivered to the jobsite in manufacturer's original packaging, and stored in a clean, dry area in accordance with manufacturer's instructions.

## 1.7 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one year period shall be provided.

## PART 2 PRODUCTS

### 2.1 EXTERIOR SIGNAGE DIMENSIONAL BUILDING LETTERS

#### 2.1.1 Fabrication

Letters shall be fabricated from cast aluminum. Letters shall be cleaned by chemical etching or cleaned ultrasonically in a special degreasing bath. Letters shall be packaged for protection until installation.

#### 2.1.2 Typeface

Typeface shall be helvetica medium.

#### 2.1.3 Size

Letter size shall be as indicated.

#### 2.1.4 Finish

Satin finished, brushed aluminum.

#### 2.1.5 Mounting

Threaded studs of number and size as recommended by manufacturer, shall be used for concealed anchorage. Letters which project from the building line shall have stud spacer sleeves. Letters, studs, and sleeves shall be of the same material. Install letters with a maximum of 2-1/4 inches clear between nominal face of masonry and letters. Templates for mounting shall be supplied.

### 2.2 ALUMINUM ALLOY PRODUCTS

Aluminum alloy products shall conform to ASTM B 26/B 26M or ASTM B 108 for castings. Welding for aluminum products shall conform to AWS C1.1M/C1.1.

### 2.3 ANCHORS AND FASTENERS

Exposed anchor and fastener materials shall be compatible with metal to which applied and shall match in color and finish and shall be non-rusting, non-corroding, and non-staining. Exposed fasteners shall be tamper-proof.

### 2.4 SHOP FABRICATION AND MANUFACTURE

#### 2.4.1 Factory Workmanship

Work shall be assembled in the shop, as far as practical, ready for installation at the site. Work that cannot be shop assembled shall be given a trial fit in the shop to ensure proper field assembly. Holes for bolts and screws shall be drilled or punched. Drilling and punching shall produce clean, true lines and surfaces. Exposed surfaces of work shall have a smooth finish and exposed riveting shall be flush. Fastenings shall be concealed. Joints exposed to the weather shall be formed to exclude water.

#### 2.4.2 Dissimilar Materials

Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive

materials subject to wetting, the surfaces shall be protected with a coat of asphalt varnish or a coat of zinc-molybdate primer to prevent galvanic or corrosive action.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Dimensional letters shall be installed in accordance with approved manufacturer's instructions at locations shown on the approved detail drawings. Signs shall be installed plumb and true at mounting heights indicated, and by method shown or specified. Signs mounted on other surfaces shall not be installed until finishes on such surfaces have been completed.

##### 3.1.1 Anchorage

Anchorage and fastener materials shall be in accordance with approved manufacturer's instructions for the indicated substrate.

##### 3.1.2 Protection and Cleaning

The work shall be protected against damage during construction. Sign surfaces shall be cleaned in accordance with manufacturer's instructions. After signs are completed and inspected, the Contractor shall cover all project identification, directional, and other signs which may mislead the public. Covering shall be maintained until instructed to be removed by the Contracting Officer or until the facility is to be opened for business. Signs shall be cleaned, as required, at time of cover removal.

#### 3.2 BUILDING SIGNAGE SCHEDULE

Exterior signage dimensional building letters consists of 2 lines, all upper case characters. Right justify each line vertically. Lines read in descending order. First line in 12 inch high characters reads: ANTHONY BEAT. Second line in 8 inch high characters reads: MISSION EMPLOYMENT CENTER. Center each line on vertical axis. See drawings for location.

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## SECTION 10440

## INTERIOR SIGNAGE

07/02

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## ALUMINUM ASSOCIATION (AA)

AA PK-1 (1999) Registration Record of Aluminum Association Alloy Designations and Chemical Composition Limits for Aluminum Alloys in the Form of Castings and Ingot

## ASTM INTERNATIONAL (ASTM)

ASTM B 209 (2002a) Aluminum and Aluminum-Alloy Sheet and Plate

ASTM B 221 (2002) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

## AMERICAN WELDING SOCIETY (AWS)

AWS D1.2 (1997) Structural Welding Code - Aluminum

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-02 Shop Drawings

Detail Drawings; G-AE

Drawings showing elevations of each type of sign, dimensions, details and methods of mounting or anchoring, shape and thickness of materials, and details of construction. A schedule showing the location, each sign type, and message shall be included.

## SD-03 Product Data

Installation; G-AE

Manufacturer's descriptive data, catalogs cuts, installation and cleaning instructions.

#### SD-04 Samples

##### Interior Signage; G-AE

One sample of each of the following sign types showing typical quality and workmanship. The samples may be installed in the work, provided each sample is identified and location recorded.

- a. Corridor offices, meeting rooms (Sign Type 1)
- b. Restrooms, utility rooms (Sign Type 2)
- c. Private offices (Sign Type 3).

Two samples of manufacturer's standard color chips for each material requiring color selection.

#### SD-10 Operation and Maintenance Data

##### Approved Manufacturer's Instructions Protection and Cleaning

Six copies of operating instructions outlining the step-by-step procedures required for system operation shall be provided. The instructions shall include simplified diagrams for the system as installed. Six copies of maintenance instructions listing routine procedures, repairs, and guides shall be provided. The instructions shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Each set shall be permanently bound and shall have a hard cover. The following identification shall be inscribed on the covers: the words "OPERATING AND MAINTENANCE INSTRUCTIONS", name and location of the facility, name of the Contractor, and contract number.

### 1.3 GENERAL

Interior signage shall be of the design, detail, sizes, types, and message content shown on the drawings, shall conform to the requirements specified, and shall be provided at the locations indicated. Signs shall be complete with lettering, framing as detailed, and related components for a complete installation. Recyclable materials shall conform to EPA requirements in accordance with Section 01670 RECYCLED / RECOVERED MATERIALS.

#### 1.3.1 Character Proportions and Heights

Letters and numbers on indicated signs in handicapped-accessible buildings, which do not designate permanent rooms or spaces, shall have a width-to-height ratio between 3:5 and 1:1 and a stroke-width-to-height ratio between 1:5 and 1:10. Characters and numbers on indicated signs shall be sized according to the viewing distance from which they are to be read. The minimum height is measured using an upper case letter "X". Lower case characters are permitted. Suspended or projected overhead signs shall have a minimum character height of 3 inches.

### 1.3.2 Raised and Brailled Characters and Pictorial Symbol Signs (Pictograms)

Letters and numbers on indicated signs which designate permanent rooms and spaces in handicapped-accessible buildings shall be raised 1/32 inch upper case, sans serif or simple serif type and shall be accompanied with Grade 2 Braille. Raised characters shall be at least 5/8 inch in height, but no higher than 2 inches. Pictograms shall be accompanied by the equivalent verbal description placed directly below the pictogram. The border dimension of the pictogram shall be 6 inches minimum in height. Indicated accessible facilities shall use the international symbol of accessibility.

### 1.4 QUALIFICATIONS

Signs, plaques, and dimensional letters shall be the standard product of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate signs that have been in satisfactory use at least 2 years prior to bid opening.

### 1.5 DELIVERY AND STORAGE

Materials shall be delivered to the jobsite in manufacturer's original packaging and stored in a clean, dry area in accordance with manufacturer's instructions.

### 1.6 EXTRA STOCK

The Contractor shall provide extra frames and extra stock of the following: 6 blank plates of each color and size for sign types 1, 2, 3.

## PART 2 PRODUCTS

### 2.1 ROOM IDENTIFICATION/DIRECTIONAL SIGNAGE SYSTEM

Signs shall be fabricated of extruded aluminum conforming to ASTM B 221.

#### 2.1.1 Standard Room Signs

Signs shall consist of aluminum alloy with photopolymer laminate containing encapsulated graphics (Sign Type 1), aluminum-based photopolymer tactile and Braille characters (Sign Type 2).

Signs shall consist of matte finish acrylic plastic. Corners of signs shall be squared.

#### 2.1.2 Changeable Message Strip Signs

Changeable message strip signs shall consist of aluminum alloy with photopolymer laminate containing encapsulated graphics face with message slots and associated end caps, as detailed, for insertion of changeable message strips. Size of signs shall be as shown on the drawings. Individual message strips to permit removal, change, and reinsertion shall be provided as detailed. Corners of signs shall be squared.

#### 2.1.3 Type of Mounting For Signs

Extruded aluminum brackets, mounted as shown, shall be furnished for hanging, projecting, and double-sided signs. Mounting for framed, hanging, and projecting signs shall be by mechanical fasteners. Surface mounted signs shall be provided with VHB (very high bond) tape (Sign Type 1, 3), extruded aluminum alloy track-type rail mounted to wall with manufacturer's



recommended fasteners (Sign Type 2).

#### 2.1.4 Graphics

Signage graphics for modular identification/directional signs shall conform to the following:

Cast aluminum letters shall be provided and fastened to the message panel with concealed fasteners. Aluminum letter finish shall be as specified. Letters shall project 1/32 inch minimum from face of panel (Sign Type 2, 3).

Pressure sensitive prespaced and prealigned precision computer cut vinyl letters on release paper shall be provided. Edges and corners of finished letter forms and graphics shall be true and clean. Vinyl sheeting for graphics shall be 5 to 7 year premium type and shall be a minimum 0.003 inch film thickness. Film shall include a precoated pressure sensitive adhesive backing (Sign Type 1).

### 2.2 ALUMINUM ALLOY PRODUCTS

Aluminum extrusions shall be at least 1/8 inch thick, and aluminum plate or sheet shall be at least 0.0508 inch thick. Extrusions shall conform to ASTM B 221; plate and sheet shall conform to ASTM B 209. Where anodic coatings are specified, alloy shall conform to AA PK-1 alloy designation 514.0. Exposed anodized aluminum finishes shall be as shown. Welding for aluminum products shall conform to AWS D1.2.

### 2.3 FABRICATION AND MANUFACTURE

#### 2.3.1 Factory Workmanship

Holes for bolts and screws shall be drilled or punched. Drilling and punching shall produce clean, true lines and surfaces. Exposed surfaces of work shall have a smooth finish and exposed riveting shall be flush. Fastenings shall be concealed where practicable.

#### 2.3.2 Dissimilar Materials

Where dissimilar metals are in contact, the surfaces will be protected to prevent galvanic or corrosive action.

### 2.4 COLOR, FINISH, AND CONTRAST

Color shall be in accordance with Section 09915 COLOR SCHEDULE. In buildings required to be handicapped-accessible, the characters and background of signs shall be eggshell, matte, or other non-glare finish. Characters and symbols shall contrast with their background - either light characters on a dark background or dark characters on a light background.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Signs shall be installed in accordance with approved manufacturer's instructions at locations shown on the detail drawings. Signs shall be installed plumb and true at mounting heights indicated, and by method shown or specified. Required blocking shall be installed as detailed. Signs

which designate permanent rooms and spaces in handicapped-accessible buildings shall be installed on the wall adjacent to the latch side of the door. Where there is no wall space to the latch side of the door, including at double leaf doors, signs shall be placed on the nearest adjacent wall. Mounting location for such signage shall be so that a person may approach within 3 inches of signage without encountering protruding objects or standing within the swing of a door. Signs on doors or other surfaces shall not be installed until finishes on such surfaces have been installed. Signs installed on glass surfaces shall be installed with matching blank back-up plates in accordance with manufacturer's instructions.

#### 3.1.1 Anchorage

Anchorage shall be in accordance with approved manufacturer's instructions.

Anchorage not otherwise specified or shown shall include slotted inserts, expansion shields, and powder-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine carriage bolts for steel; lag bolts and screws for wood. Exposed anchor and fastener materials shall be compatible with metal to which applied and shall have matching color and finish. Where recommended by signage manufacturer, foam tape pads may be used for anchorage. Foam tape pads shall be minimum 1/16 inch thick closed cell vinyl foam with adhesive backing. Adhesive shall be transparent, long aging, high tech formulation on two sides of the vinyl foam. Adhesive surfaces shall be protected with a 5 mil green flatstock treated with silicone. Foam pads shall be sized for the signage as per signage manufacturer's recommendations. Signs mounted to painted gypsum board surfaces shall be removable for painting maintenance. Signs mounted to lay-in ceiling grids shall be mounted with clip connections to ceiling tees.

#### 3.1.2 Protection and Cleaning

The work shall be protected against damage during construction. Hardware and electrical equipment shall be adjusted for proper operation. Glass, frames, and other sign surfaces shall be cleaned in accordance with the manufacturer's approved instructions.

-- End of Section --

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## SECTION 10650A

## OPERABLE PARTITIONS

12/03

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM E 84	(2001) Surface Burning Characteristics of Building Materials
ASTM E 90	(2002) Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
ASTM E 413	(1987; R 1999) Rating Sound Insulation

## 1.2 GENERAL REQUIREMENTS

The Contractor shall supply and install flat wall, manual operation, acoustical operable partitions as shown on the drawings including all hardware, seals, track and rollers as needed to close the specified opening. The partition shall be made up of a series of rigid, flat wall panels; each panel being a one-piece assembly nominally 48 inches wide. Unless otherwise specified, the wall shall comprise the least number of panels. The mechanical seal of the panel shall actuate with a single operating action.

## 1.2.1 Manual Operation

The manual operation shall be accomplished with less than 20 lbf force to start movement at the rate of 3.33 ft/s (200 ft/min). A removable handle shall be used to extend and retract the bottom operable seals; vertical movement of seals shall be 2 inches. Closure to the lead wall shall be by use of a flexible bulb; final closing shall be accomplished by means of a lever exerting pressure against wall.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Operable Partitions; G-AE

Drawings containing complete schematic diagrams and details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation.

#### SD-03 Product Data

##### Operable Partitions

Manufacturer's descriptive data, performance charts, catalog cuts, and installation instructions.

#### SD-04 Samples

##### Operable Partitions; G-AE

Color samples of specified surfaces and finishes to match those specified. Finish and color requirements shall not be limited to manufacturer's standard selections in order to meet these requirements.

#### SD-07 Certificates

##### Materials; G-AE

##### Operable Partitions; G-AE

Certificate attesting that the materials meet the requirements specified and that partitions have specified acoustical and flame retardant properties, as determined by test.

#### SD-10 Operation and Maintenance Data

##### Operable Partitions

Six complete copies of operating instructions outlining the procedures required for manually operated partitions. The instructions shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and operating features. Data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of the parts recommended by the manufacturer to be replaced after 1 year and 3 years of service. Six complete copies of maintenance instructions explaining routine maintenance procedures including inspection, adjustments, lubrication, and cleaning. The instructions shall list possible breakdown, methods of repair, and a troubleshooting guide.

### 1.4 DELIVERY AND STORAGE

Materials shall be delivered to the jobsite in the manufacturer's original, unopened packages and shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, or other contaminants.

### 1.5 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend

beyond a 1 year period shall be provided.

## PART 2 PRODUCTS

### 2.1 MATERIALS

Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least 2 year prior to bid opening. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site. Door and partition finishes shall have a Class A rating when tested in accordance with ASTM E 84.

#### 2.1.1 Panel Surface Finish

Vinyl wallcovering material. For material and color/pattern selection, see Section 09915 COLOR SCHEDULE.

#### 2.1.2 Hardware

Operable partitions shall have manufacturer's standard hardware. Hardware shall be manufacturer's standard silver metallic paint finish.

#### 2.1.3 Sweep Strips

Sweep strips shall be vinyl or other material which will not crack or craze with severe usage. Sweep strip shall control STC to the specified rating.

#### 2.1.4 Track

Track shall be recessed as shown and shall be of extruded aluminum or enamel finish steel. Track shall be manufacturer's standard product designed for the weight of the finished partition, including door. Track sections shall be provided in the maximum lengths practicable, not less than 6 feet long except for narrow doors and at ends of runs where short length is required. Suitable joint devices such as interlocking keys shall be provided at each joint to provide permanent alignment of track.

#### 2.1.5 Metal Soffit

Soffit shall be provided when steel track is recessed. Soffit shall be of metal of adequate thickness to protect the ceiling from damage by door operation and shall be provided with the door manufacturer's standard neutral-color applied finish. Soffit on aluminum track shall be an integral part of the track.

#### 2.1.6 Vinyl Restrictions

Vinyls shall contain a non-mercury based mildewcide and shall be manufactured without the use of cadmium-based stabilizers.

### 2.2 OPERABLE PARTITIONS

Operable partitions shall consist of top hung ball bearing carriers which support paired modular panels. Partition finish shall have a flame spread rating of not more than 25 in accordance with ASTM E 84.

### 2.2.1 Panels

Panels shall be constructed of minimum 16 gauge thick steel frames with minimum 22 gauge thick face panels spot welded to the frame. Panels shall be not more than 4 feet wide, except for end closure panels, and shall be full height to track. Panels shall lock in place to form a stable, rigid partition; low profile hinges shall project 1/4 inch maximum from panel edge. Panels shall be surfaced with vinyl wallcovering which wraps around the vertical panel edges without vertical trim. Panel thickness (3 inch nominal) and composition shall be designed to provide an STC rating of not less than 50 in accordance with ASTM E 90 and ASTM E 413.

### 2.2.2 Doors

Doors shall have vinyl sweep top seals which compress against the bottom of the top track. Doors shall be nonfire rated and shall be manually operated.

### 2.2.3 Seals

Bottom seals shall consist of a vinyl sweep mechanical seal which will expand in place or shall be accomplished by using panels which can be lowered by a removable operating device. Vertical seal between panels shall be anodized, architectural grade, aluminum extrusion with vinyl sound seal. Top seal shall consist of manufacturer's standard mechanical retractable sealing system with vinyl seals.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Installation shall be in accordance with the manufacturer's approved installation instructions.

-- End of Section --

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SECTION 10800

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## SECTION 10800

## TOILET ACCESSORIES

07/02

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C 1036 (2001) Flat Glass

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-03 Product Data

Finishes; G-AE  
Accessory Items; G-AE

Manufacturer's descriptive data and catalog cuts indicating materials of construction, fasteners proposed for use for each type of wall construction, mounting instructions, operation instructions, and cleaning instructions.

## SD-04 Samples

Finishes; G-AE  
Accessory Items; G-AE

One sample of each accessory proposed for use. Approved samples may be incorporated into the finished work, provided they are identified and their locations noted.

## SD-07 Certificates

Accessory Items

Submit for each type of accessory specified, attesting that the items meet the specified requirements.

## SD-10 Operation and Maintenance Data

Electric Hand Dryer; G-AE

Four complete copies of maintenance instructions listing routine maintenance procedures and possible breakdowns and repairs. Instructions shall include simplified wiring and control diagrams and other information necessary for unit maintenance.

### 1.3 DELIVERY, STORAGE, AND HANDLING

Toilet accessories shall be wrapped for shipment and storage, delivered to the jobsite in manufacturer's original packaging, and stored in a clean, dry area protected from construction damage and vandalism.

### 1.4 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period shall be provided.

## PART 2 PRODUCTS

### 2.1 MANUFACTURED UNITS

Toilet accessories shall be provided where indicated in accordance with paragraph SCHEDULE. Porcelain type, tile-wall accessories are specified in Section 09310 CERAMIC TILE. Each accessory item shall be complete with the necessary mounting plates and shall be of sturdy construction with corrosion resistant surface.

#### 2.1.1 Anchors and Fasteners

Anchors and fasteners shall be capable of developing a restraining force commensurate with the strength of the accessory to be mounted and shall be suited for use with the supporting construction. Exposed fasteners shall be of tamperproof design and shall be finished to match the accessory.

#### 2.1.2 Finishes

Except where noted otherwise, finishes on metal shall be provided as follows:

Metal	Finish
Stainless steel	No. 4 satin finish
Carbon steel, copper alloy, and brass	Chromium plated, satin finish

### 2.2 ACCESSORY ITEMS

Accessory items shall conform to the requirements specified below.

#### 2.2.1 Grab Bar (GB)

Grab bar shall be 18 gauge, 1-1/4 inches OD Type 304 stainless steel. Grab bar shall be form and length as indicated. Exposed mounting flange shall have mounting holes concealed. Grab bar shall have peened non-slip surface. Installed bars shall be capable of withstanding a 500 pound vertical load without coming loose from the fastenings and without obvious permanent deformation. Space between wall and grab bar shall be 1-1/2

inch.

#### 2.2.2 Mirrors, Glass (MG)

Glass for mirrors shall be Type I transparent flat type, Class 1-clear. Glazing Quality q1 1/4 inch thick conforming to ASTM C 1036. Glass shall be coated on one surface with silver coating, copper protective coating, and mirror backing paint. Silver coating shall be highly adhesive pure silver coating of a thickness which shall provide reflectivity of 83 percent or more of incident light when viewed through 1/4 inch thick glass, and shall be free of pinholes or other defects. Copper protective coating shall be pure bright reflective copper, homogeneous without sludge, pinholes or other defects, and shall be of proper thickness to prevent "adhesion pull" by mirror backing paint. Mirror backing paint shall consist of two coats of special scratch and abrasion-resistant paint and shall be baked in uniform thickness to provide a protection for silver and copper coatings which will permit normal cutting and edge fabrication. Frames shall be Type 304 stainless steel.

#### 2.2.3 Combination Paper Towel Dispenser/Waste Receptacle Units (PTDWR)

Dispenser/receptacle shall be semi-recessed and shall have a minimum capacity of 400 sheets of C-fold, single-fold, or quarter-fold towel. Waste receptacle shall be designed to be locked in unit and removable for service. Locking mechanism shall be tumbler key lock. Waste receptacle shall have a minimum capacity of 12 gallons. Unit shall be fabricated of not less than 0.30 inch stainless steel welded construction with all exposed surfaces having a satin finish. Waste receptacle that accepts reusable molded plastic liner standard for unit manufacturer shall be provided.

#### 2.2.4 Sanitary Napkin Disposer (SND)

Sanitary napkin disposal shall be constructed of Type 304 stainless steel with removable leak-proof receptacle for disposable liners. Fifty disposable liners of the type standard with the manufacturer shall be provided. Receptacle shall be retained in cabinet by tumbler lock. Disposer shall be provided with a door for inserting disposed napkins, and shall be surface mounted.

#### 2.2.5 Soap Dispenser (SD)

Soap dispenser shall be surface mounted, liquid type consisting of a vertical Type 304 stainless steel tank with a minimum holding capacity of 32 fluid ounces with a corrosion-resistant all-purpose valve that dispenses liquid soaps, lotions, detergents and antiseptic soaps.

#### 2.2.6 Towel Bar (TB)

Towel bar shall be stainless steel with a minimum thickness of .015 inch. Bar shall be minimum 3/4 inch diameter, or 5/8 inch square. Finish shall be satin.

#### 2.2.7 Towel Pin (TP)

Towel pin shall have concealed wall fastenings, and a pin integral with or permanently fastened to wall flange. Maximum projection shall be 4 inches. Design shall be consistent with design of other accessory items. Finish shall be satin.

### 2.2.8 Toilet Tissue Dispenser, Jumbo (TTDJ)

Toilet tissue dispenser shall be surface mounted that holds 5 standard rolls of tissue. Cabinet shall be fabricated of Type 304, 18 gauge stainless steel with Type 304, 20 gauge stainless steel door. Cover shall have key lock.

### 2.2.9 Electric Hand Dryer (EHD)

Electric hand dryer shall be semi-recessed and shall be designed to operate on 110/125 volts, 60 cycle, single phase alternating current with a heating element core rating of not more than 2100 watts. Dryer housing shall be of single piece construction and shall be chrome plated steel.

### 2.2.10 Mop Holder with Shelf (MH-S)

Mop holder with shelf shall be surfaced mounted and shall be fabricated from 18 gauge, Type 304 stainless steel, satin finish. Shelf shall be 8 inches deep and 44 inches long. Four anti-slip mop holders with spring-loaded rubber cams that grip handles and five stainless steel hooks shall be provided.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Surfaces of fastening devices exposed after installation shall have the same finish as the attached accessory. Exposed screw heads shall be of tamperproof design. Install accessories at the location and height indicated. Protect exposed surfaces of accessories with strippable plastic or by other means until the installation is accepted. After acceptance of accessories, remove and dispose of strippable plastic protection. Coordinate accessory manufacturer's mounting details with other trades as their work progresses. Brackets, plates, anchoring devices and similar items used for mounting accessories in showers shall be bedded in a silicone sealant as they are set to provide a watertight installation. After installation, thoroughly clean exposed surfaces and restore damaged work to its original condition or replace with new work.

#### 3.1.1 Recessed Accessories

Fasten accessories with wood screws to studs, blocking or rough frame in wood construction. Set anchors in mortar in masonry construction. Fasten to metal studs or framing with sheet metal screws in metal construction.

#### 3.1.2 Surface Mounted Accessories

Mount on concealed backplates, unless specified otherwise. Accessories without backplates shall have concealed fasteners. Unless indicated or specified otherwise, install accessories with sheet metal screws or wood screws in lead-lined braided jute, teflon or neoprene sleeves, or lead expansion shields, or with toggle bolts or other approved fasteners as required by the construction. Install backplates in the same manner, or provide with lugs or anchors set in mortar, as required by the construction. Fasten accessories mounted on gypsum board and plaster walls without solid backing into the metal or wood studs or to solid wood blocking secured between wood studs, or to metal backplates secured to metal studs.

### 3.2 CLEANING

Material shall be cleaned in accordance with manufacturer's recommendations. Alkaline or abrasive agents shall not be used. Precautions shall be taken to avoid scratching or marring of surfaces.

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SECTION 11035

BULLET-RESISTANT COMPONENTS

04/00

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## SECTION 11035

## BULLET-RESISTANT COMPONENTS

04/00

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## ALUMINUM ASSOCIATION (AA)

- |           |  |
|-----------|--|
| AA DAF-45 | (1997) Designation System for Aluminum Finishes      |
| AA SAA-46 | (1978) Standards for Anodized Architectural Aluminum |

## ASTM INTERNATIONAL (ASTM)

- |                   |  |
|-------------------|--|
| ASTM A 123/A 123M | (2002) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products   |
| ASTM A 653/A 653M | (2002a) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process          |
| ASTM C 1036       | (2001) Flat Glass  |
| ASTM C 1048       | (1997b) Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass   |
| ASTM C 1172       | (1996e1) Laminated Architectural Flat Glass  |
| ASTM D 905        | (1998) Strength Properties of Adhesive Bonds in Shear by Compression Loading   |
| ASTM D 1003       | (1997) Haze and Luminous Transmittance of Transparent Plastics   |
| ASTM D 1044       | (1999) Resistance of Transparent Plastics to Surface Abrasion  |
| ASTM D 3951       | (1998) Commercial Packaging  |
| ASTM D 4093       | (1995) Photoelastic Measurements of Birefringence and Residual Strains in Transparent or Translucent Plastic Materials |
| ASTM E 1300       | (2002) Determining Load Resistance of Glass in Buildings   |



ASTM F 428	(1997e1) Test Method for Intensity of Scratches on Aerospace Glass Enclosures
ASTM F 520	(1977; R 1997) Environmental Resistance of Aerospace Transparencies
ASTM F 521	(1983; R 1997e1) Bond Integrity of Transparent Laminates
ASTM F 548	(1981; R 1994e1) Test Method for Intensity of Scratches on Aerospace Transparent Plastics
ASTM F 735	(1994) Abrasion Resistance of Transparent Plastics and Coatings Using the Oscillating Sand Method

#### H.P. WHITE LABORATORY (HPW)

HPW TP-0501.01	(1989) Ballistic Resistance of Structural Materials (Opaque and Transparent); Test Procedures and Acceptance Criteria
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#### NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2002) National Electrical Code
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## 1.2 SYSTEM DESCRIPTION

### 1.2.1 Design Requirements

Bullet resistant components shall conform to the requirements specified for the particular items and as much as possible shall be complete assemblies by a single manufacturer.

### 1.2.2 Performance Requirements

All items specified shall be bullet resistant to the threat specified. Movable and operable components shall operate smoothly and freely. When a reference for performance is listed, operation shall conform to referenced requirements.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

##### Installation; G-AE

Drawings containing complete wiring and schematic diagrams where appropriate and any other details required to demonstrate that the system has been coordinated and will properly function as a unit.

Drawings shall show proposed layout and anchorage of components and appurtenances, and relationship to other parts of work including clearances for operation and maintenance. Drawings sufficient to show conformance to all requirements, including fabrication details, sizes, thickness of materials, anchorage, finishes, hardware location and installation.

#### SD-03 Product Data

Bullet Resistant Components; G-AO

Manufacturer's descriptive data and installation instructions. Descriptive data shall include cleaning instructions as recommended by the plastic sheet manufacturer.

#### SD-07 Certificates

Bullet Resistant Components; G-AO

Manufacturer's certificates attesting that all components conform to the requirements on drawings and in specifications. Submittal shall include testing reports from independent testing laboratories indicating conformance to regulatory requirements.

#### SD-10 Operation and Maintenance Data

Bullet Resistant Components; G-AO

Six copies of operation and six copies of maintenance manuals for the assembly furnished. The manuals shall be approved prior to beneficial occupancy.

### 1.4 STANDARD PRODUCTS

Materials and components shall be the standard products of a manufacturer regularly engaged in the manufacture of such products unless otherwise indicated and detailed on the drawings, and shall essentially duplicate items that have been in satisfactory use for at least two years prior to bid opening. Components shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site, or by the manufacturer. Where components are detailed on the drawings and do not conform to a manufacturer's standard product, components shall be constructed of manufacturer's standard materials which conform to the specified ballistic standard or test.

### 1.5 COMPONENT TEST REQUIREMENTS

Bullet-resistant components shall be provided at locations shown on the drawings. Bullet-resistant components shall be in accordance with NIJ Type I.

### 1.6 DELIVERY, STORAGE, AND HANDLING

Components shall be delivered to the job site with the brand, name, and model number clearly marked thereon. All components shall be delivered, stored and handled so as not to be damaged or deformed, and in accordance with ASTM D 3951. Assembly shall be handled carefully to prevent damage to the faces, edges, corners, ends, and glazing. Abraded, scarred, or rusty areas shall be cleaned, repaired, or replaced immediately upon detection.

Damaged components that cannot be restored to like-new condition shall be replaced. Components and equipment shall be stored in a dry location on platforms or pallets that are ventilated adequately, free of dust, water, and other contaminants, and stored in a manner which permits easy access for inspection and handling.

#### 1.7 WARRANTY

Manufacturer's warranty for 5 years shall be furnished for glazing materials. Warranty shall provide for replacement and installation of glazing if delamination, discoloration, or cracking, or crazing occurs.

### PART 2 PRODUCTS

#### 2.1 GENERAL

Bullet-resistant component assemblies shall be of size and type indicated and shall be provided at locations shown. All items included for exterior installation shall be designed to resist water penetration or entrapment.

#### 2.2 ELECTRICAL WIRING

Electrical wiring and conduit shall be provided as specified in Section 16415A ELECTRICAL WORK, INTERIOR.

#### 2.3 FINISHES

All ferrous metal components except stainless steel shall be furnished primed for painting unless indicated otherwise. Finish painting shall be in accordance with Section 09900 PAINTS AND COATINGS unless otherwise indicated. Aluminum items shall be finished in standard mill finish unless otherwise specified. When anodic coatings are specified, the coatings shall conform to AA SAA-46, with coating thickness not less than that specified for protective and decorative type finish in AA DAF-45. Items to be anodized shall receive a polished satin finish pretreatment and a clear lacquer overcoat.

#### 2.4 TRANSACTION DRAWER AND WINDOW UNIT

Transaction drawer and window unit is specifically designed composed of integral window with bullet-resistant glazing, built-in electrically powered microphone and speaker, with manually operated transaction drawer with design preventing outer door extension unless the inner door is completely closed. Exposed materials consist of brushed stainless steel. The transaction door consists of a stainless steel front flange with a UL listed level non-ricochet bullet resistant fiberglass panel in front and rear of a movable drawer assembly; supported on ball bearing slides. Drawer assembly shall have horizontal travel of not less than 10 1/2 inches and be provided with manufacturer's standard 16 GA sliding dip tray. Unit shall have a stainless steel sliding drawer. Actuating handle of stainless steel draw cover shall be stainless steel. Window framing shall be manufacturer's standard steel to match finish transaction drawer.

##### 2.4.1 Glazing Materials

Glazing material shall be factory fabricated units designed to be bullet-resistant to the specified test standard in paragraph COMPONENT TEST REQUIREMENTS. Glazing material shall be glass, with a no-spall protected (interior) face. No-spall interior face shall meet requirements for spall

resistance defined in HPW TP-0501.01. Glazing material shall conform to applicable requirements contained in ASTM C 1036, ASTM C 1048, and ASTM E 1300. Glazing materials shall be tested in accordance with the applicable sections of the following testing procedures: ASTM D 905, ASTM D 1003, ASTM F 428, ASTM F 548, ASTM D 4093, and ASTM F 520.

#### 2.4.1.1 Laminated Glass

Bullet-resistant laminated glass shall be all glass laminated construction conforming to applicable sections of ASTM C 1172. The adhesive interlayer material for bonding glass to glass shall be chemically compatible with the surfaces which are to be bonded. Materials selected for lamination purposes shall be tested in accordance with the following testing procedures: ASTM D 905, ASTM D 1044, ASTM F 735, ASTM D 4093, ASTM F 521, ASTM F 520, and ASTM D 1003. Glass plies used in the lamination shall be annealed float glass conforming to Type I, quality q3 Class 1, in accordance with ASTM C 1036.

#### 2.5 LABELING

Bullet-resistant equipment shall be plainly labeled in accordance with regulatory requirements. Label shall be compatible with plastic or coating. Label shall be visible only on protected side, after installation and shall include the following information:

- a. Manufacturer's name or identifying symbol
- b. Model Number, Control Number, or equivalent
- c. Date of manufacture by week, month or quarter and year. This may be abbreviated or be in a traceable code such as the lot number.
- d. Correct mounting position including threat side and secure side (by removable label on glazing material).
- e. Code indicating bullet-resistant rating and test standard used (by removable label on glazing material).

#### 2.6 FASTENERS

Fasteners exposed to view shall match in color and finish and shall harmonize with the material to which fasteners are applied. Fasteners shall be in accordance with Section 05500A MISCELLANEOUS METAL.

#### 2.7 CORROSION PROTECTION - DISSIMILAR MATERIALS

Contact surfaces between dissimilar metals and aluminum surfaces in contact with concrete, masonry, or absorptive materials subject to wetting, shall be given a protective coating in accordance with Section 09900 PAINTS AND COATINGS.

#### 2.8 SHOP/FACTORY FINISHING

All factory or manufactured components shall be shop finished as indicated below.

##### 2.8.1 Ferrous Metal

Surfaces of ferrous metal, except galvanized and stainless steel surfaces,

shall be cleaned and shop coated with the manufacturer's standard protective coating other than a bituminous protective coating, compatible with finish coats. Prior to shop painting, surfaces shall be cleaned with solvents to remove grease and oil, and with power wire-brushing or sandblasting to remove loose rust, loose mill scale and other foreign substances. Surfaces of items to be embedded in concrete shall not be shop painted.

#### 2.8.2 Galvanizing

Items specified to be galvanized shall be hot-dip processed after fabrication. Galvanizing shall be in accordance with ASTM A 123/A 123M or ASTM A 653/A 653M as applicable.

#### 2.8.3 Aluminum

Unless otherwise specified, aluminum items shall be standard mill finish. Anodic coatings shall conform to paragraph FINISHES.

#### 2.8.4 Stainless Steel

Provide manufacturer's standard stainless steel finishes on all exposed to view metal surfaces.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

Existing work shall be examined to ensure that it is ready for installation or erection of the components. Components shall be checked and corrected for racking, twisting, and other malformation prior to installation. Frames must be set true and plumb and remain aligned for proper installation. All surfaces and connections shall be examined for damage prior to installation.

#### 3.2 PREPARATION AND PROTECTION

The Contractor shall field verify dimensions of rough openings for components, and shall verify that surfaces of openings are plumb, true, and provide required clearances. The Contractor shall protect surrounding work prior to installation of bullet-resistant components. Surrounding work which is damaged as a result of the installation of bullet-resistant components shall be restored to like-new condition prior to acceptance of the work described herein.

#### 3.3 INSTALLATION

The finished work shall be rigid, neat in appearance and free from defects. Equipment shall be installed plumb and level, and secured rigidly in place. All components shall be installed in accordance with approved manufacturer's recommended instructions. All operable parts of components shall be tested for smooth, trouble-free operation, in the presence of the Contracting Officer's representative.

#### 3.4 ELECTRICAL WORK

All electrical work shall be in accordance with Section 16415A ELECTRICAL WORK, INTERIOR. Flexible connections between doors and fixed supports shall be made with extra flexible type SO cable, except in hazardous

locations where wiring shall conform to NFPA 70. The cable shall have a spring-loaded automatic take up reel, or an equivalent and approved device.

### 3.5 ADJUSTING/CLEANING

Adjustments shall be made to pass-thru drawers to assure smooth operation. Units shall be weathertight when closed and locked. All components shall be cleaned in accordance with manufacturer's instructions.

### 3.6 SCHEDULING

Glazing of bullet-resistant windows except factory-glazed units shall occur only after all concrete, masonry, ceiling, electrical, mechanical, plumbing and adjacent finish work has been completed to avoid damage to the glazing material. Factory-glazed windows shall be covered to protect them from damage during adjacent finish work.

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SECTION 12490A

WINDOW TREATMENT

12/03

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## SECTION 12490A

## WINDOW TREATMENT

12/03

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM G 21 (1996; R 2002) Determining Resistance of Synthetic Polymeric Materials to Fungi

ASTM G 22 (1976; R 1996) Determining Resistance of Plastics to Bacteria

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 701 (1999) Fire Tests for Flame Propagation of Textiles and Films

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-02 Shop Drawings

## Approved Detail Drawings; G-AE

Drawings showing fabrication and installation details. Project specific drawings shall show layout and locations of track, direction of draw, mounting heights, details, and full wiring diagrams.

## SD-03 Product Data

Window Treatments  
Hardware

Manufacturer's data composed of catalog cuts, brochures, product information, maintenance instructions, shading coefficients, and ETL/UL rating.

## SD-04 Samples

## Window Treatments



Three samples of each type and color of window treatment. Blind slats or louvers shall be 6 inches in length for each color. Track shall be 6 inches in length. Shade material shall be minimum 6 x 6 inches in size.

### 1.3 GENERAL REQUIREMENTS

Window treatment shall be provided, complete with necessary brackets, fittings, and hardware. Each window treatment type shall be a complete unit provided in accordance with paragraph WINDOW TREATMENT PLACEMENT SCHEDULE. Equipment shall be mounted and operated as indicated. Windows to receive a treatment shall be completely covered. The Contractor shall take measurements at the building and shall be responsible for the proper fitting and hanging of the equipment.

### 1.4 DELIVERY, STORAGE, AND HANDLING

Components shall be delivered to the jobsite in the manufacturer's original packaging with the brand or company name, item identification, and project reference clearly marked. Components shall be stored in a dry location that is adequately ventilated and free from dust, water, or other contaminants and shall have easy access for inspection and handling. Materials shall be stored flat in a clean dry area with temperature maintained above 50 degrees F.

### 1.5 FIELD MEASUREMENTS

The Contractor shall become familiar with details of the work, verify dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

### 1.6 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period shall be provided. If any component of the hardware shade cloth system fails in normal operation, it shall be repaired or replaced under the terms of a factory return warranty for a period of twenty five (25) years. This must be a fit-for-use warranty. Electrical components shall be warranted to be free of defects for five years from the date of installation. The warranty will be void if the products have been improperly installed, not wired in accordance with shade manufacturer's wiring diagrams, or subject to improper care. Chain is not included, as it is a normal maintenance item.

### 1.7 QUALITY ASSURANCE

Manufacturer must have a minimum of 5 years experience in the actual production of specified products. Installer must be approved by the manufacturer prior to bid. Installer personnel must have 3 years minimum experience with the specified system and have completed a minimum of 3 comparable scale projects using this system.

## PART 2 PRODUCTS

### 2.1 WINDOW SHADES

Roller tube shall operate smoothly and be of sufficient diameter and thickness to prevent excessive deflection. Brackets shall be provided that

are appropriate for mounting as shown on drawings . The shade mounting system shall have asymmetrically shaped channels in which a matching snap-on vinyl spline can be mounted. The spline and shade shall be easily removable and replaceable for cleaning, disinfecting or repair without removing the shade-tube. Attachment of the shade band shall not be with adhesives or staples. The shade cloth shall meet the performance described in NFPA 701, small scale test. Steel features shall be treated for corrosion resistance.

#### 2.1.1 Light Filtering Shades

Light filtering shades shall conform to the following: Roller tube shall be steel and shall operate by clutch and bead operation mechanism. Fascia mounting brackets shall be steel to support roller tube and fascia panel. The fascia panel shall be channel shaped extruded aluminum with standard enamel finish. The shade shall be made from a single piece of thermoplastic matrix, polyester core yarn. Fabric shall pass the large or small Vertical Burn Requirements of NFPA 701. Fabric colors and types shall be per the Material Schedule. Shade fabric shall pass ASTM G 22-80 Bacterial Growth and ASTM G 21-85 Fungal Growth with a "no growth" rating.

#### 2.1.2 Room Darkening Shades

Room darkening (black-out) window shades shall conform to the following: Roller tube shall be aluminum. Light traps shall be shop fabricated, and shall consist of a head box to house the shade roller, and U-shaped channels with polyseal to serve as guides for the shade along the sides and to receive the bottom edge of the shade along the sill. Light trap shall be made of sheet steel having a minimum thickness of 22 gauge or anodized, extruded, aluminum. The legs of the channels shall be not less than 1-3/4 inches long and separated by the minimum distance that will permit free operation of the shade. Edges of light trap coming into contact with the shade cloth shall be smooth pile light seal. The exposed face of the head box shall be hinged or removable for access to the shade roller. The exposed portions of the light trap shall have a factory-applied anodized clear finish as shown. Shade roller shall be manufacturer's standard product. Cloth shall be of type for blackout purposes. When not finished with a selvage, the vertical edges of the shade shall be bound or hemmed using a high-grade thread. Needle holes shall be made lightproof by applying a suitable filler. The bottom edge of the shade shall be fitted with a steel operating bar. Shades will engage positively with bottom rail through chain pull. Pull cords shall be made of beaded chain having not less than 175 pounds breaking strength.

### 2.2 MOTORIZED SYSTEM

Electrical roller shade system shall consist of a tubular motor concealed inside the extruded aluminum tube with asymmetrical channels to which shade and mounting spline are attached. The brackets shall consist of 1/8 inch steel brackets and molded Delrin. Entire system must be ETL tested and listed.

Motors shall be asynchronous with reversible capacitor designed for intermittent operation. They shall be thermally protected, temperature Class I, totally enclosed. The motor assemblies shall further consist of a solenoid-activated disk brake and internal limit switches, which are externally adjustable. 120v-60hz, 120 watts/motor and .95 amps/ motor. Motors shall be furnished with two feet of BX cable and locking plug as required for the return air function.

Each bay or group of electrically operated shades shown on the drawings shall be operated from a key activated flush switch. IQ/MLC Controllers shall be used to control multiple motors and to provide up to five positions that are pre-set. All shades in a room must stop exactly at the same pre-set stops points.

### 2.3 MANUAL SYSTEM

Manual shade system shall have stainless steel chain Brackets and operating assembly shall consist of 1/8 inch steel and molded Delrin. Delrin drive bracket shall be bead chain drive operated with a chain of Qualified Stainless Steel, 90 lb. test. Upper and lower top limits shall be provided. Shadecloth clearance shall be a maximum of 1/4 inch on idle end and 9/16 inch on the drive end. Chain must be offset to the back of the opening to allow the extruded aluminum fascia to be used and a minimum of opening. Extruded pocket shall be provided. These shall be sized as required for each size of shade. They shall be supplied with a continuous closure mount and be easily removable. Color shall match the window framing. No exposed fasteners are permitted.

### 2.4 COLOR

Color shall be in accordance with Section 09915 COLOR SCHEDULE.

### 2.5 FABRICATION

Shades shall be fabricated square with a snap-on spline for mechanical fastening directly to the mounting tube. A weighted hembar shade shall be heat sealed within the shade. No loose hembar will be allowed. Cutting shall be done with an edge-sealing hot-knife. All shades shall be full width of the windows as per the elevations. No splitting of the shades will be allowed.

## PART 3 EXECUTION

### 3.1 WINDOW TREATMENT PLACEMENT SCHEDULE

Schedule provided in SID/CID package.

### 3.2 INSTALLATION

Installation shall be in accordance with the approved detail drawings and manufacturer's installation instructions. Units shall be level, plumb, secure, and at proper height and location relative to window units. The Contractor shall furnish and install supplementary or miscellaneous items in total, including clips, brackets, or anchorages incidental to or necessary for a sound, secure, and complete installation. Installation shall not be initiated until completion of room painting and finishing operations. Upon completion of the installation, window treatments shall be adjusted for form and appearance, shall be in proper operating condition, and shall be free from damage or blemishes. Damaged units shall be repaired or replaced by the Contractor as directed by the Contracting Officer. Install only with a firm approved by the manufacturer and according to the manufacturer's written instructions and shop drawings. All electrical control equipment (switches, IQMLC's, etc.) as indicated shall be installed according to the manufacturer's shop drawings and in accordance with the N.E.C. and local codes by a qualified electrical contractor and under the electrical section of this specification. Install

all shades regular roll, with shade and fascia level and square. Multiple banks of shades shall be operated with each motor or chain. Reverse roll shades shall be provided where indicated on the drawings. Reverse roll shades must have the entire chain system at the front of the shade. Place lower shade limit so the shade stops 1 inch above the sill. Blackout shades shall lower to where it is a light seal at the bottom as well as on each side. Place upper limit at the point the hem bar meets the roll.

### 3.3 CLEANING

Clean all visible surfaces and repair or replace any damaged items. Remove all debris caused by this material and contractor.

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11/03

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-- End of Section Table of Contents --

## SECTION 12610

## FIXED SEATING

11/03

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## HARDWOOD PLYWOOD &amp; VENEER ASSOCIATION (HPVA)

HPVA HP-1 (2000) American National Standard for  
Hardwood and Decorative Plywood

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA LD 3 (2000) High-Pressure Decorative Laminates

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-02 Shop Drawings

Placement of Standards; G-AE  
Installation; G-AE

Drawings indicating metal thickness, fastenings, details of hinge mechanism, seat and back dimensions, proposed finish, and including seating plans showing row spacing, row lengths, the varying lateral spacing at backs and seats, back pitch, and seat widths for the various section lengths, floor pitch, and riser height, where applicable.

## SD-03 Product Data

Seating System

Manufacturer's descriptive data, catalog cuts, and installation instructions.

## SD-04 Samples

Seating System; G-AE

Samples of upholstery, plywood, laminate, paint, and plastic finish materials and one complete chair. Fabric samples shall be

of sufficient size to show color range, pattern, and finish. Chair sample may be incorporated into the installation, provided it is identified and the location noted.

### 1.3 DELIVERY AND STORAGE

Components shall be delivered to the site in unopened containers clearly labeled with the manufacturer's name and container contents. Materials shall be stored in a safe, dry, and clean location. Handling of items shall be in a manner that will protect the materials from damage.

### 1.4 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one year period shall be provided.

## PART 2 PRODUCTS

### 2.1 MATERIALS

Recyclable materials (seat padding, plastics, etc.) shall conform to EPA requirements in accordance with Section 01670 RECYCLED / RECOVERED MATERIALS.

#### 2.1.1 Woven Fabric Upholstery

Fabric shall be treated to resist staining and soiling. Fabric color and pattern shall be as shown in Section 09915 COLOR SELECTION.

#### 2.1.2 Polyurethane Foam

Polyurethane foam shall be high density, fire retardant, nonhardening and nonoxidizing and shall have a high resistance to alkalies, oils, grease, soaps, abrasions, moisture, mildew, and tearing.

#### 2.1.3 Plywood

Plywood shall conform to HPVA HP-1. Unexposed veneers shall be sound grade hardwood or Grade A fir. All face veneers shall be not more than 1/16 inch in thickness, of clear stock, and free from imperfections.

#### 2.1.4 Laminated Plastic Sheets

Laminated plastic sheets shall conform to NEMA LD 3, Type 1, Grade GP 50, nominal thickness 0.050 inch.

#### 2.1.5 Molded Plastic

Molded plastic shall be high density. Component surfaces shall have a textured finish.

### 2.2 SEATING SYSTEM

Components and assembly shall be free from objectionable projections or irregularities. Corners and edges shall be smooth and rounded. Bolts, nuts, and other fastenings shall be capped. Exposed welds shall be ground and dressed smooth. Casting shall be fine textured, sound, and free of pits, blow holes, and fins. Lines shall be true, accurate, and true-to-pattern with excess metal or imperfections removed. Fastening

shall be concealed where possible.

#### 2.2.1 Backs

Back assembly shall consist of an exposed, plastic rear panel with an upholstered steel or plywood front panel. Back assembly length shall be between 20 and 27-1/2 inches for a total height of 29 to 38 inches above the floor measured parallel to the back. Rear panel shall completely conceal and protect the rest of the seat assembly when in the raised position. Back shall be fixed type.

##### 2.2.1.1 Plastic Panels

Plastic rear panels shall be one-piece injection molded plastic. Color and texture of plastic panels shall be as shown in Section 09915 COLOR SCHEDULE.

##### 2.2.1.2 Foam Padding

Polyurethane foam shall be high density, fire retardant and shall be not less than approximately 2 inches in thickness and shall be securely attached to the steel or plywood panel and completely covered with the approved upholstery material.

#### 2.2.2 Seats

Foundation for upholstered seats shall be formed of not less than 20 gauge electronically glued hardwood plywood. The seat foundation shall be free from visible screws, bolts, open holes, and projections on the bottom, front, and sides. The front edge of each seat shall be embossed to receive a number plate. The upholstered seat unit shall be easily removable without removing the foundation unit; and the covering shall be fastened to the frame in a manner that will permit easy reupholstering.

#### 2.2.3 Hinges

Hinges shall be a counterweight mechanism using gravity to return to the upright position or of the full compensating type, completely enclosed, totally independent, free and easy in operation, and capable of compensating for circular installation, variation in installation conditions, and unevenness of floors. Hinge mechanism shall be of the push-back type to allow additional aisle space while in an open position. Each hinge shall have a noiseless, self-rising seat device, shall rise automatically to a uniform safety position of 3/4 fold at all times, and shall fold 100 percent when additional pressure is applied, to provide additional clearance. The hinges shall have oil-impregnated, self-lubricating, metal or brass alloy bearings that will not require further lubrication, or nylon bushings.

#### 2.2.4 Standards

##### 2.2.4.1 Floor Standards

Floor standards shall be tubular steel, sheet steel, or cast iron. The standards shall be formed to fit the floor incline so that the standards will be vertical and the hinge point will be at a height that will maintain proper relation of seat to floor. The feet shall be formed to eliminate tripping hazards and shall have holes for bolt attachment to the floor.



### 2.2.5 Armrests

Armrests shall be plastic.

### 2.2.6 Tablet Arm

Each chair shall be equipped with a fold-away tablet arm assembly. Tablet arm shall be fabricated of manufacturer's standard core material faced with plastic laminate. All edges shall be rounded. When in a writing position, the arm shall lock firmly in place so that it cannot be accidentally disengaged. A spring actuated device shall automatically lock the folded tablet arm in position beside the seat. Color shall be as shown in Section 09915 COLOR SCHEDULE.

### 2.2.7 Seat Number and Row Plates

Plastic number and letter plates for seat and row designations shall be the manufacturer's standard adhesive attached, having letters and numbers on contrasting background.

### 2.2.8 Aisle Lighting

Aisle or end standard panels shall have surface mounted aisle lights. Light wiring shall be routed through concealed casing into floor.

### 2.2.9 Electrical Work

Electrical materials shall conform to the requirements of Section 16415A ELECTRICAL WORK, INTERIOR.

## 2.3 COLOR

Color shall be in accordance with Section 09915 COLOR SCHEDULE.

## PART 3 EXECUTION

### 3.1 PLACEMENT OF STANDARDS

The system shall permit the standards to be installed as shown on the drawings for each row of units. Standards in each row shall be placed laterally so the aisle-end standards will be in alignment as indicated on seating layout drawing. The angle of inclination of backs shall be adjusted for variations in sightlines. Mechanical attachment of components shall be of sufficient flexibility so that when permanently assembled they will compensate for the changing dimensions laterally between standards. Seat and back attachments shall absorb inaccuracies in lateral spacing of standards at point of attachment caused by unevenness of floor. Varying lateral dimensions of backs and seats shall be in accordance with approved seating layout. Provide 21 inch and 22 inch wide seating units to complete seating as shown.

#### 3.1.1 Seating Schedule

Provide the following type and number of seats:

Right Tablet Arms:	72
Left Table Arms:	8
Total Seats:	80

### 3.2 INSTALLATION

Installation of the seating system shall be in accordance with the seating drawings and approved installation instructions.

-- End of Section --

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SECTION 13100A

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## SECTION 13100A

LIGHTNING PROTECTION SYSTEM  
07/01

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C135.30 (1988) Zinc-Coated Ferrous Ground Rods for  
Overhead or Underground Line Construction

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2002) National Electrical Code

NFPA 780 (1997) Installation of Lightning  
Protection Systems

## UNDERWRITERS LABORATORIES (UL)

UL 96 (1994; Rev thru Jan 2000) Lightning  
Protection Components

UL 96A (1994; Rev thr Jul 1998) Installation  
Requirements for Lightning Protection  
Systems

UL 467 (1993; Rev thru Feb 2001) Grounding and  
Bonding Equipment

UL Elec Const Dir (2003) Electrical Construction Equipment  
Directory

## 1.2 GENERAL REQUIREMENTS

## 1.2.1 Verification of Dimensions

The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work. No departures shall be made without the prior approval of the Contracting Officer.

## 1.2.2 System Requirements

The system furnished under this specification shall consist of the standard products of a manufacturer regularly engaged in the production of lightning protection systems and shall be the manufacturer's latest UL approved design. The lightning protection system shall conform to NFPA 70 and NFPA 780, UL 96 and UL 96A, except where requirements in excess thereof are

specified herein.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

##### Drawings; G-AE

Detail drawings consisting of a complete list of material, including manufacturer's descriptive and technical literature, catalog cuts, drawings, and installation instructions. Detail drawings shall demonstrate that the system has been coordinated and will function as a unit. Drawings shall show proposed layout and mounting and relationship to other parts of the work.

#### SD-07 Certificates

##### Materials; G-AE

Where material or equipment is specified to comply with requirements of UL, proof of such compliance. The label of or listing in UL Elec Const Dir will be acceptable evidence. In lieu of the label or listing, a written certificate from an approved nationally recognized testing organization equipped to perform such services, stating that the items have been tested and conform to the requirements and testing methods of Underwriters Laboratories may be submitted. A letter of findings shall be submitted certifying UL inspection of lightning protection systems provided on the following facilities: G-AE.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 General Requirements

No combination of materials shall be used that form an electrolytic couple of such nature that corrosion is accelerated in the presence of moisture unless moisture is permanently excluded from the junction of such metals. Where unusual conditions exist which would cause corrosion of conductors, conductors with protective coatings or oversize conductors shall be used. Where a mechanical hazard is involved, the conductor size shall be increased to compensate for the hazard or the conductors shall be protected by covering them with molding or tubing made of wood or nonmagnetic material. When metallic conduit or tubing is used, the conductor shall be electrically connected at the upper and lower ends.

#### 2.1.2 Main and Secondary Conductors

Conductors shall be in accordance with NFPA 780 and UL 96 for Class I, Class II, or Class II modified materials as applicable.

#### 2.1.2.1 Copper

Copper conductors used on nonmetallic stacks shall weigh not less than 375 pounds per thousand feet, and the size of any wire in the cable shall be not less than No. 15 AWG. The thickness of any web or ribbon used on stacks shall be not less than No. 12 AWG. Counterpoise shall be copper conductors not smaller than No. 1/0 AWG.

#### 2.1.2.2 Aluminum

Aluminum shall not contact the earth nor shall it be used in any other manner that will contribute to rapid deterioration of the metal. Appropriate precautions shall be observed at connections with dissimilar metals. Aluminum conductors for bonding and interconnecting metallic bodies to the main cable shall be at least equivalent to strength and cross-sectional area of a No. 4 AWG aluminum wire. When perforated strips are provided, strips that are much wider than solid strips shall be. A strip width that is at least twice that of the diameter of the perforations shall be used. Aluminum strip for connecting exposed water pipes shall be not less than No. 12 AWG in thickness and at least 1-1/2 inches wide.

#### 2.1.3 Air Terminals

Terminals shall be in accordance with UL 96 and NFPA 780. The tip of air terminals on buildings used for manufacturing, processing, handling, or storing explosives, ammunition, or explosive ingredients shall be a minimum of 2 feet above the ridge parapet, ventilator or perimeter. On open or hooded vents emitting explosive dusts or vapors under natural or forced draft, air terminals shall be a minimum of 5 feet above the opening. On open stacks emitting explosive dusts, gases, or vapor under forced draft, air terminals shall extend a minimum of 15 feet above vent opening. Air terminals more than 24 inches in length shall be supported by a suitable brace, with guides not less than one-half the height of the terminal.

#### 2.1.4 Ground Rods

Rods made of copper-clad steel shall conform to UL 467 and galvanized ferrous rods shall conform to ANSI C135.30. Ground rods shall be not less than 3/4 inch in diameter and 10 feet in length. Ground rods of copper-clad steel, stainless steel, galvanized ferrous, and solid copper shall not be mixed on the job.

#### 2.1.5 Connectors

Clamp-type connectors for splicing conductors shall conform to UL 96, class as applicable, and, Class 2, style and size as required for the installation.

#### 2.1.6 Lightning Protection Components

Lightning protection components, such as bonding plates, air terminal supports, chimney bands, clips, and fasteners shall conform to UL 96, classes as applicable.

## PART 3 EXECUTION

### 3.1 INTEGRAL SYSTEM

#### 3.1.1 General Requirements

The lightning protection system shall consist of air terminals, roof conductors, down conductors, ground connections, and grounds, electrically interconnected to form the shortest distance to ground. All conductors on the structures shall be exposed except where conductors are in protective sleeves exposed on the outside walls. Secondary conductors shall interconnect with grounded metallic parts within the building. Interconnections made within side-flash distances shall be at or above the level of the grounded metallic parts.

##### 3.1.1.1 Air Terminals

Air terminal design and support shall be in accordance with NFPA 780. Terminals shall be rigidly connected to, and made electrically continuous with, roof conductors by means of pressure connectors or crimped joints of T-shaped malleable metal and connected to the air terminal by a dowel or threaded fitting. Air terminals at the ends of the structure shall be set not more than 2 feet from the ends of the ridge or edges and corners of roofs. Spacing of air terminals 2 feet in height on ridges, parapets, and around the perimeter of buildings with flat roofs shall not exceed 25 feet.

In specific instances where it is necessary to exceed this spacing, the specified height of air terminals shall be increased not less than 2 inches for each foot of increase over 25 feet. On large, flat or gently sloping roofs, as defined in NFPA 780, air terminals shall be placed at points of the intersection of imaginary lines dividing the surface into rectangles having sides not exceeding 50 feet in length. Air terminals shall be secured against overturning either by attachment to the object to be protected or by means of a substantial tripod or other braces permanently and rigidly attached to the building or structure. Metal projections and metal parts of buildings, smokestacks, and other metal objects that do not contain hazardous materials and that may be struck but not appreciably damaged by lightning, need not be provided with air terminals. However, these metal objects shall be bonded to the lightning conductor through a metal conductor of the same unit weight per length as the main conductor. Where metal ventilators are installed, air terminals shall be mounted thereon, where practicable. Any air terminal erected by necessity adjacent to a metal ventilator shall be bonded to the ventilator near the top and bottom. Where metal ventilators are installed with air terminals mounted thereon, the air terminal shall not be more than 24 inches away from the farther edge or corner. If the air terminal is farther than this distance, an additional air terminal shall be added in order to meet this requirement. Where metal ventilators are installed with air terminals mounted adjacent, the air terminal shall not be more than 24 inches away from the farther edge or corner. If the air terminal is farther than this distance, an additional air terminal shall be added in order to meet this requirement.

##### 3.1.1.2 Roof Conductors

Roof conductors shall be connected directly to the roof or ridge roll. Sharp bends or turns in conductors shall be avoided. Necessary turns shall have a radius of not less than 8 inches. Conductors shall preserve a downward or horizontal course and shall be rigidly fastened every 3 feet along the roof and down the building to ground. Metal ventilators shall be

rigidly connected to the roof conductor at three places. All connections shall be electrically continuous. Roof conductors shall be coursed along the contours of flat roofs, ridges, parapets, and edges; and where necessary, over flat surfaces, in such a way as to join each air terminal to all the rest. Roof conductors surrounding tank tops, decks, flat surfaces, and flat roofs shall be connected to form a closed loop.

#### 3.1.1.3 Down Conductors

Down conductors shall be electrically continuous from air terminals and roof conductors to grounding electrodes. Down conductors shall be coursed over extreme outer portions of the building, such as corners, with consideration given to the location of ground connections and air terminals. Each building or structure shall have not less than two down conductors located as widely separated as practicable, at diagonally opposite corners. On rectangular structures having gable, hip, or gambrel roofs more than 110 feet long, there shall be at least one additional down conductor for each additional 50 feet of length or fraction thereof. On rectangular structures having French, flat, or sawtooth roofs exceeding 250 feet in perimeter, there shall be at least one additional down conductor for each 100 feet of perimeter or fraction thereof. On an L- or T-shaped structure, there shall be at least one additional down conductor; on an H-shaped structure, at least two additional down conductors; and on a wing-built structure, at least one additional down conductor for each wing.

On irregularly shaped structures, the total number of down conductors shall be sufficient to make the average distance between them along the perimeter not greater than 100 feet. On structures exceeding 50 feet in height, there shall be at least one additional down conductor for each additional 60 feet of height or fraction thereof, except that this application shall not cause down conductors to be placed about the perimeter of the structure at intervals of less than 50 feet. Additional down conductors shall be installed when necessary to avoid "dead ends" or branch conductors ending at air terminals, except where the air terminal is on a roof below the main protected level and the "dead end" or branch conductor is less than 16 feet in length and maintains a horizontal or downward coursing. Down conductors shall be equally and symmetrically spaced about the perimeter of the structure.

#### 3.1.1.4 Interconnection of Metallic Parts

Metal doors, windows, and gutters shall be connected directly to the grounds or down conductors using not smaller than No. 6 copper conductor, or equivalent. Conductors placed where there is probability of unusual wear, mechanical injury, or corrosion shall be of greater electrical capacity than would normally be used, or shall be protected. The ground connection to metal doors and windows shall be by means of mechanical ties under pressure, or equivalent.

#### 3.1.1.5 Ground Connections

Ground connections comprising continuations of down conductors from the structure to the grounding electrode shall securely connect the down conductor and ground in a manner to ensure electrical continuity between the two. All connections shall be of the clamp type. There shall be a ground connection for each down conductor. Metal water pipes and other large underground metallic objects shall be bonded together with all grounding mediums. Ground connections shall be protected from mechanical injury. In making ground connections, advantage shall be taken of all permanently moist places where practicable, although such places shall be



avoided if the area is wet with waste water that contains chemical substances, especially those corrosive to metal.

#### 3.1.1.6 Grounding Electrodes

A grounding electrode shall be provided for each down conductor located as shown. A driven ground shall extend into the earth for a distance of not less than 10 feet. Ground rods shall be set not less than 3 feet, nor more than 8 feet, from the structures foundation. The complete installation shall have a total resistance to ground of not more than 5 ohms if a counterpoise is not used. Ground rods shall be tested individually prior to connection to the system and the system as a whole shall be tested not less than 24 hours after rainfall. When the resistance of the complete installation exceeds the specified value or two ground rods individually exceed 25 ohms, the Contracting Officer shall be notified immediately. A counterpoise, where required, shall be of No. 1/0 copper cable or equivalent material having suitable resistance to corrosion and shall be laid around the perimeter of the structure in a trench not less than 2 feet deep at a distance not less than 3 feet nor more than 8 feet from the nearest point of the structure. All connections between ground connectors and grounds or counterpoise, and between counterpoise and grounds shall be electrically continuous. Where so indicated on the drawings, an alternate method for grounding electrodes in shallow soil shall be provided by digging trenches radially from the building. The lower ends of the down conductors are then buried in the trenches.

#### 3.1.2 Metal Roofs

Wood-Frame, Wall-Bearing Masonry or Tile Structure with Metallic Roof and Nonmetallic Exterior Walls, or Reinforced Concrete Building with Metallic Roof: Metal roofs which are in the form of sections insulated from each other shall be made electrically continuous by bonding. Air terminals shall be connected to, and made electrically continuous with, the metal roof as well as the roof conductors and down conductors. Ridge cables and roof conductors shall be bonded to the roof at the upper and lower edges of the roof and at intervals not to exceed 100 feet. The down conductors shall be bonded to roof conductors and to the lower edge of the metal roof.

Where the metal of the roof is in small sections, the air terminals and down conductors shall have connections made to at least four of the sections. All connections shall have electrical continuity and have a surface contact of at least 3 square inches.

#### 3.1.3 Metal Roofs With Metal Walls

Wood-Frame Building With Metal Roof and Metal Exterior Walls: The metal roof and the metal walls shall be bonded and made electrically continuous and considered as one unit. The air terminals shall be connected to and made electrically continuous with the metal roof as well as the roof and down conductors. All connections shall have electrical continuity and have a surface contact of at least 3 square inches.

#### 3.1.4 Steel Frame Building

The steel framework shall be made electrically continuous. Electrical continuity may be provided by bolting, riveting, or welding steel frame, unless a specific method is noted on the drawings. The air terminals shall be connected to the structural steel framework at the ridge. Short runs of conductors shall be used as necessary to join air terminals to the metal framework so that proper placing of air terminals is maintained. Separate

down conductors from air terminals to ground connections are not required. Where a grounded metal pipe water system enters the building, the structural steel framework and the water system shall be connected at the point of entrance by a ground connector. Connections to pipes shall be by means of ground clamps with lugs. Connections to structural framework shall be by means of nut and bolt or welding. All connections between columns and ground connections shall be made at the bottom of the steel columns. Ground connections to grounding electrons or counterpoise shall be run from not less than one-half of all the columns distributed equally around the perimeter of the structure at intervals averaging not more than 60 feet.

### 3.1.5 Ramps

Lightning protection for covered ramps (connecting passageways) shall conform to the requirements for lightning protection systems for buildings of similar construction. A down conductor and a driven ground shall be placed at one of the corners where the ramp connects to each building or structure. This down conductor and driven ground shall be connected to the counterpoise or nearest ground connection of the building or structure. Where buildings or structures and connecting ramps are clad with metal, the metal of the buildings or structures and metal of the ramp shall be connected to ensure electrical continuity, in order to avoid the possibility of a flash-over or spark due to a difference in potential.

### 3.2 INTERCONNECTION OF METAL BODIES

Metal bodies of conductance shall be protected if not within the zone of protection of an air terminal. Metal bodies of conductance having an area of 400 square inches or greater or a volume of 1000 cubic inches or greater shall be bonded to the lightning protection system using main size conductors and a bonding plate having a surface contact area of not less than 3 square inches. Provisions shall be made to guard against the corrosive effect of bonding dissimilar metals. Metal bodies of inductance shall be bonded at their closest point to the lightning protection system using secondary bonding conductors and fittings. A metal body that exceeds 5 feet in any dimension, that is situated wholly within a building, and that does not at any point come within 6 feet of a lightning conductor or metal connected thereto shall be independently grounded.

### 3.3 FENCES

Except as indicated below, metal fences that are electrically continuous with metal posts extending at least 2 feet into the ground require no additional grounding. Other fences shall be grounded on each side of every gate. Fences shall be grounded by means of ground rods every 1000 to 1500 feet of length when fences are located in isolated places, and every 500 to 750 feet when in proximity (100 feet or less) to public roads, highways, and buildings. The connection to ground shall be made from the post where it is of metal and is electrically continuous with the fencing. All metal fences shall be grounded at or near points crossed by overhead lines in excess of 600 volts and at distances not exceeding 150 feet on each side of line crossings.

### 3.4 INSPECTION

The lightning protection system will be inspected by the Contracting Officer to determine conformance with the requirements of this specification. No part of the system shall be concealed until so

authorized by the Contracting Officer.

-- End of Section --

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## SECTION 13110A

## CATHODIC PROTECTION SYSTEM (SACRIFICIAL ANODE)

11/98

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM B 843 (1993; R 1998) Magnesium Alloy Anodes for Cathodic Protection

## NACE INTERNATIONAL (NACE)

NACE RP0169 (2002) Control of External Corrosion on Underground or Submerged Metallic Piping Systems

NACE RP0188 (1999) Discontinuity (Holiday) Testing of Protective Coatings

NACE RP0190 (1995) External Protective Coatings for Joints, Fittings, and Valves on Metallic Underground or Submerged Pipelines and Piping Systems

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2002) National Electrical Code

## UNDERWRITERS LABORATORIES (UL)

UL 510 (1994; Rev thru Apr 1998) Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be

submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

##### Drawings; G-AO

Six copies of detail drawings consisting of a complete list of equipment and material including manufacturer's descriptive and technical literature, catalog cuts, results of system design calculations including soil-resistivity, installation instructions and certified test data stating the maximum recommended anode current output density and the rate of gaseous production if any at that current density. Detail drawings shall contain complete wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and will function properly as a unit.

##### Contractor's Modifications; G-AO

Six copies of detail drawings showing proposed changes in location, scope of performance indicating any variations from, additions to, or clarifications of contract drawings. The drawings shall show proposed changes in anode arrangement, anode size and number, anode materials and layout details, conduit size, wire size, mounting details, wiring diagram, method for electrically-isolating each pipe, and any other pertinent information to proper installation and performance of the system.

#### SD-03 Product Data

##### Equipment; G

Within 30 days after receipt of notice to proceed, an itemized list of equipment and materials including item number, quantity, and manufacturer of each item. The list shall be accompanied by a description of procedures for each type of testing and adjustments, including testing of coating for thickness and holidays. Installation of materials and equipment shall not commence until this submittal is approved.

##### Spare Parts

Spare parts data for each different item of material and equipment specified, after approval of detail drawings and not later than six (6) months prior to the date of beneficial occupancy. The data shall include a complete list of parts, special tools, and supplies, with current unit prices and source of supply. One (1) spare anode and one spare test station shall be furnished.

#### SD-06 Test Reports

##### Tests and Measurements; G-AO

Test reports in booklet form tabulating all field tests and measurements performed, upon completion and testing of the installed system and including close interval potential survey, casing and interference tests, final system test verifying protection, insulated joint and bond tests, and holiday coating



test.

#### Contractor's Modifications; G-AO

Final report regarding Contractor's modifications. The report shall include pipe-to-soil measurements throughout the affected area, indicating that the modifications improved the overall conditions, and current measurements for anodes. The following special materials and information are required: taping materials and conductors; installation and testing procedures, and equipment; coating material; system design calculations for anode number, life, and parameters to achieve protective potential; backfill shield material and installation details showing waterproofing; bonding and waterproofing details; insulated resistance wire; exothermic weld equipment and material.

#### SD-07 Certificates

##### Cathodic Protection System

Proof that the materials and equipment furnished under this section conform to the specified requirements contained in the referenced standards or publications. The label or listing by the specified agency will be acceptable evidence of such compliance.

##### Services of "Corrosion Expert"

Evidence of qualifications of the "corrosion expert."

a. The "corrosion expert's" name and qualifications shall be certified in writing to the Contracting Officer prior to the start of construction.

b. Certification shall be submitted giving the name of the firm, the number of years of experience, and a list of not less than five (5) of the firm's installations three (3) or more years old that have been tested and found satisfactory.

#### SD-10 Operation and Maintenance Data

##### Cathodic Protection System; G-AO

Before final acceptance of the cathodic protection system, six copies of operating manuals outlining the step-by-step procedures required for system startup, operation, adjustment of current flow, and shutdown. The manuals shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Six copies of maintenance manual, listing routine maintenance procedures, recommendation for maintenance testing, possible breakdowns and repairs, and troubleshooting guides. The manuals shall include single-line diagrams for the system as installed; instructions in making pipe-to-reference cell potential measurements and frequency of monitoring; instructions for dielectric connections, interference and sacrificial anode bonds; instructions shall include precautions to ensure safe conditions during repair of pipe or other metallic systems. The instructions shall be neatly bound between permanent covers and titled "Operating and Maintenance Instructions." These instructions

shall be submitted for the Contracting Officer's approval. The instructions shall include the following:

a. As-built drawings, to scale of the entire system, showing the locations of the piping and metallic components, location of all anodes and test stations, locations of all insulating joints, and structure-to-reference cell potentials as measured during the tests required by Paragraph: TESTS AND MEASUREMENTS, of this section.

b. Recommendations for maintenance testing, including instructions in making pipe-to-reference cell potential measurements and frequency of testing.

c. All maintenance and operating instructions and nameplate data shall be in English.

d. Instructions shall include precautions to insure safe conditions during repair of pipe system.

Training Course; G-AO

The proposed Training Course Curriculum (including topics and dates of discussion) indicating that all of the items contained in the operating and maintenance instructions, as well as demonstrations of routine maintenance operations, including testing procedures included in the maintenance instructions, are to be covered.

### 1.3 GENERAL REQUIREMENTS

The Contractor shall furnish and install a complete, operating, sacrificial anode cathodic protection system in complete compliance with NFPA 70, with all applicable Federal, State, and local regulations and with minimum requirements of this contract. The services required include planning, installation, adjusting and testing of a cathodic protection system, using sacrificial anodes for cathodic protection of the Water and Fire Protection lines, their connectors and . The cathodic protection system shall include anodes, cables, connectors, corrosion protection test stations, and any other equipment required for a complete operating system providing the NACE criteria of protection as specified. Insulators are required whenever needed to insulate the pipes from any other structure. The cathodic protection shall be provided on Water and Fire Protection pipes.

#### 1.3.1 Services of "Corrosion Expert"

The Contractor shall obtain the services of a "corrosion expert" to supervise, inspect, and test the installation and performance of the cathodic protection system. "Corrosion expert" refers to a person, who by thorough knowledge of the physical sciences and the principles of engineering and mathematics, acquired by professional education and related practical experience, is qualified to engage in the practice of corrosion control of buried or submerged metallic surfaces. Such a person must be accredited or certified by the National Association of Corrosion Engineers (NACE) as a NACE Accredited Corrosion Specialist or a NACE certified Cathodic Protection (CP) Specialist or be a registered professional engineer who has certification or licensing that includes education and experience in corrosion control of buried or submerged metallic piping and tank systems, if such certification or licensing includes 5 years

experience in corrosion control on underground metallic surfaces of the type under this contract. The "corrosion expert" shall make at least 3 visits to the project site. The first of these visits shall include obtaining soil resistivity data, acknowledging the type of pipeline coatings to be used and reporting to the Contractor the type of cathodic protection required. Once the submittals are approved and the materials delivered, the "corrosion expert" shall revisit the site to ensure the Contractor understands installation practices and laying out the components. The third visit shall involve testing the installed cathodic protection systems and training applicable personnel on proper maintenance techniques. The "corrosion expert" shall supervise installation and testing of all cathodic protection.

#### 1.3.2 Contractor's Modifications

The specified system is based on a complete system with magnesium sacrificial anodes. The Contractor may modify the cathodic protection system after review of the project, site verification, and analysis, if the proposed modifications include the anodes specified and will provide better overall system performance. The modifications shall be fully described, shall be approved by the Contracting Officer's representative, and shall meet the following criteria. The proposed system shall achieve a minimum pipe-to-soil "instant off" potential of minus 850 millivolts with reference to a saturated copper-copper sulfate reference cell on the underground components of the piping or other metallic surface. The Contractor shall take resistivity measurements of the soil in the vicinity of the pipes and ground bed sites. Based upon the measurements taken, the current and voltage shall be required to produce a minimum of minus 850 millivolts "instant off" potential between the structure being tested and the reference cell. This potential shall be obtained over 95 percent of the metallic area. The anode system shall be designed for a life of twenty-five (25) years of continuous operation.

#### 1.3.3 Isolators

Isolators are required to insulate the water and fire water pipes from above ground structures.

#### 1.3.4 Summary of Services Required

The scope of services shall include, but shall not be limited to, the following:

- a. Cathodic Protection Systems.
- b. System testing.
- c. Training.
- d. Operating and maintenance manual.
- e. Insulator testing.

f. Coating and holiday testing shall be submitted within 45 days of notice to proceed.

### 1.3.5 Nonmetallic Pipe System

In the event pipe other than metallic pipe is approved and used in lieu of metallic pipe, all metallic components of this pipe system shall be protected with cathodic protection. Detailed drawings of cathodic protection for each component shall be submitted to the Contracting Officer for approval within 45 days after date of receipt of notice to proceed, and before commencement of any work.

#### 1.3.5.1 Coatings

Coatings for metallic components shall be as required for metallic fittings. Protective covering (coating and taping) shall be completed and tested on each metallic component (such as valves, hydrants and fillings). This covering shall be as required for underground metallic pipe. Each test shall be witnessed by the Contracting Officer. Coatings shall be selected, applied, and inspected in accordance with NACE RP0190 and as specified in these specifications. The use of nonmetallic pipe does not change other requirements of the specifications. Any deviations due to the use of nonmetallic pipe shall be submitted for approval.

### 1.3.6 Tests of Components

A minimum of four (4) tests shall be made at each metallic component in the piping system. Two (2) measurements shall be made directly over the anodes and the other two (2) tests shall be over the outer edge of the component, but at the farthest point from the anodes. Structure and pipes shall be shown with the cathodic protection equipment. All components of the cathodic protection system shall be shown on drawings, showing their relationship to the protected structure or component. A narrative shall describe how the cathodic protection system will work and provide testing at each component. Components requiring cathodic protection shall include but not be limited to the following:

- a. Pipes under the floor slab or foundations.
- b. PIV.
- c. Shutoff valves.
- d. Metallic pipe extended from aboveground locations.
- e. Each connector or change-of-direction device.
- f. Any metallic pipe component or section.

### 1.3.7 Drawings

Detailed drawings shall be provided showing location of anodes, insulated fittings, test stations, and bonding. Locations shall be referenced to two (2) permanent facilities or mark points.

### 1.3.8 Electrical Potential Measurements

All potential tests shall be made at a minimum of 10 foot intervals witnessed by the Contracting Officer. Submittals shall identify test locations on separate drawing, showing all metal to be protected and all cathodic protection equipment. Test points equipment and protected metal

shall be easily distinguished and identified.

#### 1.3.9 Achievement of Criteria for Protection

All conductors, unless otherwise shown, shall be routed to or through the test stations. Each system provided shall achieve a minimum pipe-to-soil "instant off" potential of minus 1000 millivolt potentials with reference to a saturated copper-copper-sulfate reference cell on all underground components of the piping. This potential should be obtained over 95 percent of the metallic area. Testing will be witnessed by the Contracting Officer. Additional anodes shall be provided by the Contractor if required to achieve the minus 1000 millivolts "instant off". Although acceptance criteria of the cathodic protection systems are defined in NACE RP0169, for this project the "instant off" potential of minus 1000 millivolts is the only acceptable criteria.

#### 1.3.10 Metallic Components and Typicals

a. Metallic components: As a minimum, each metallic component shall be protected with one (1) magnesium anode. This number of anodes is required to achieve minus 1000 millivolts "instant off" potential on the metallic area. As a minimum, the magnesium anode unpackaged weight shall be 20 pounds. The magnesium anodes shall be located about 3 feet from the side of the metallic component and routed through a test station.

b. Fire Hydrants: Fire hydrant pipe components shall have a minimum of two (2) anodes. These magnesium anodes shall have an unpackaged weight of 20 pounds.

c. Pipe Under Concrete Slab: Pipe under concrete slab shall have a minimum of 2 magnesium anodes. These magnesium anodes shall have an unpackaged weight of 20 pounds. Pipe under concrete slab shall have 1 permanent reference electrodes located under the slab. All conductors shall be routed to a test station.

d. Valves: Each valve shall be protected with 1 magnesium anodes. The magnesium anode shall have an unpackaged weight of 20 pounds.

e. Metallic Pipe Component or Section: Each section of metallic pipe shall be protected with 1 magnesium anode. The magnesium anodes shall have an unpackaged weight of 20 pounds.

f. Connectors or Change-of-Direction Devices: Each change-of-direction device shall be protected with 1 magnesium anode. The magnesium anode shall have an unpackaged weight of 20 pounds.

#### 1.3.11 Metallic Component Coating

Coatings for metallic components shall be as required for metallic fittings as indicated. This will include fire hydrants, T's, elbows, valves, etc. Coatings shall be selected, applied, and inspected in accordance with NACE RP0190 and as specified in these specifications.

## PART 2 PRODUCTS

### 2.1 MAGNESIUM ANODES

A minimum of 2 anodes shall be installed on each pipe system. See Paragraph METALLIC COMPONENTS AND TYPICALS for additional anodes under slab.

## 2.1.1.1 Anode Composition

Anodes shall be of high-potential magnesium alloy, made of primary magnesium obtained from sea water or brine, and not made from scrap metal. Magnesium anodes shall conform to ASTM B 843 and to the following analysis (in percents) otherwise indicated:

Aluminum, max.	0.010
Manganese, max.	0.50 to 1.30
Zinc	0.05
Silicon, max.	0.05
Copper, max.	0.02
Nickel, max.	0.001
Iron, Max.	0.03
Other impurities, max.	0.05 each or 0.3 max. total
Magnesium	Remainder

The Contractor shall furnish spectrographic analysis on samples from each heat or batch of anodes used on this project.

## 2.1.2 Dimensions and Weights

Dimensions and weights of anodes shall be approximately as follows:

## TYPICAL MAGNESIUM ANODE SIZE

(Cross sections may be round, square, or D shaped)

NOMINAL WT. LBS.	APPROX. SIZE (IN)	NOMINAL GROSS WT lb PACKAGED IN BACKFILL	NOMINAL PACKAGE DIMENSIONS (IN)
3	3 X 3 X 5	8	5-1/4 X 5-1/4 X 8
5	3 X 3 X 8	13	5-1/4 X 5-1/4 X 11-1/4
9	3 X 3 X 14	27	5-1/4 X 20
12	4 X 4 X 12	32	7-1/2 X 18
17	4 X 4 X 17	45	7-1/2 X 24
20	2-1/2x2-1/2x58-3/4	72	5-1/2 x 5-1/2 x 60
32	5 X 5 X 20-1/2	68	8-1/2 X 28
50	7 X 7 X 16	100	10 X 24

## 2.1.3 Packaged Anodes

Anodes shall be provided in packaged form with the anode surrounded by specially-prepared quick-wetting backfill and contained in a water permeable cloth or paper sack. Anodes shall be centered by means of spacers in the backfill material. The backfill material shall have the following composition, unless otherwise indicated:

Material	Approximate Percent by Weight
Gypsum	75
Bentonite	20
Sodium Sulphate	5
Total	100

#### 2.1.4 Connecting Wire

##### 2.1.4.1 Wire Requirements

Wire shall be No. 12 AWG solid copper wire, not less than 10 feet long, unspliced, complying with NFPA 70, Type TW and RHH insulation. Connecting wires for magnesium anodes shall be factory installed with the place or emergence from the anode in a cavity sealed flush with a dielectric sealing compound.

#### 2.2 MISCELLANEOUS MATERIALS

##### 2.2.1 Electrical Wire

###### 2.2.1.1 Test Wires

Test wires shall be AWG No. 12 stranded copper wire with NFPA 70, Type TW or RHW or polyethylene insulation.

###### 2.2.2 Joint, Patch, Seal, and Repair Coating

Sealing and dielectric compound shall be a black, rubber based compound that is soft, permanently pliable, tacky, moldable, and unbacked. Compound shall be applied as recommended by the manufacturer, but not less than 1/2-inch thick. Coating compound shall be cold-applied coal-tar base mastic. Pressure-sensitive vinyl plastic electrical tape shall conform to UL 510.

###### 2.2.3 Thermite Weld Caps or Shields

Shields shall consist of approved pipeline wrapping or fiberglass-reinforced, coal-tar impregnated tape, or plastic weld caps, specifically made for the purpose and installed in accordance with the manufacturer's recommendations.

###### 2.2.4 Test Stations

Stations shall be of the flush-curb-box type and shall be the standard product of a recognized manufacturer. Test stations shall be complete with an insulated terminal block having the required number of terminals. The test station shall be provided with a lockable cover and shall have an embossed legend, "C.P. Test." A minimum of one (1) test station shall be provided each component of the pipe. A minimum of four (4) terminals shall be provided in each test station. A minimum of two (2) leads are required to the metallic pipe or component from each test station. Other conductors shall be provided for each anode, other foreign pipe, and reference cells as required. The test stations shall be listed for the particular application for which they are to be utilized. All structure lead wires are to be red.

###### 2.2.5 Electrical Isolation of Structures

As a minimum, isolating flanges or unions shall be provided at the following locations:

- a. Pressure piping under floor slab to a building.

b. Service entrance of water and fire water, just after the piping comes above the floor.

#### 2.2.5.1 Electrically Isolating Pipe Joints

Electrically isolating pipe joints shall be of a type that is in regular factory production.

#### 2.2.5.2 Insulating Joint Testing

A Model 601 Insulation Checker, as manufactured by "Gas Electronics" or an approved equal, shall be used for insulating joint (flange) electrical testing.

#### 2.2.6 Underground Structure Coating

This coating specification shall take precedence over any other project specification and drawing notes, whether stated or implied, and shall also apply to the pipeline or tank supplier. No variance in coating quality shall be allowed by the Contractor or Base Construction Representative without the written consent of the designer. All underground metallic pipelines and tanks to be cathodically protected shall be afforded a good quality factory-applied coating. This includes all carbon steel, cast-iron and ductile-iron pipelines or vessels. Coatings shall be selected, applied, and inspected in accordance with NACE RP0190 and as specified. If non-metallic pipelines are installed, all metallic fittings on pipe sections shall be coated in accordance with this specification section.

The nominal thickness of coatings shall be: Fusion Bonded Epoxy - 12 mil; Coal Tar Epoxy - 22 mil; Tape Systems - 20 mil plus or minus 5 percent.

##### 2.2.6.1 Inspection of Pipe Coatings

Any damage to the protective covering during transit and handling shall be repaired before installation. After field coating and wrapping has been applied, the entire pipe shall be inspected by an electric holiday detector with impressed current in accordance with NACE RP0188 using a full-ring, spring-type coil electrode. The holiday detector shall be equipped with a bell, buzzer, or other type of audible signal which sounds when a holiday is detected. All holidays in the protective covering shall be repaired immediately upon detection. Occasional checks of holiday detector potential will be made by the Contracting Officer's representative to determine suitability of the detector. All labor, materials, and equipment necessary for conducting the inspection shall be furnished by the Contractor.

a. Protective covering for aboveground piping system: Finish painting shall conform to the applicable paragraph of SECTION: 09900, PAINTING, GENERAL, and as follows:

b. Ferrous surfaces: Shop-primed surfaces shall be touched-up with ferrous metal primer. Surfaces that have not been shop-primed shall be solvent-cleaned. Surfaces that contain loose rust, loose mil scale, and other foreign substances shall be mechanically-cleaned by power wire-brushing and primed with ferrous metal primer. Primed surface shall be finished with two (2) coats of exterior oil paint and vinyl paint. Coating for each entire piping service shall be an approved pipe line wrapping having a minimum coating resistance of 50,000 Ohms per square foot.



### 2.2.7 Electrical Connections

Electrical connections shall be done as follows:

- a. Exothermic welds shall be "Cadweld", " Bundy", "Thermoweld" or an approved equal. Use of this material shall be in strict accordance with the manufacturer's recommendations.
- b. Electrical-shielded arc welds shall be approved for use on steel pipe by shop drawing submittal action.
- c. Brazing shall be as specified in Paragraph: Lead Wire Connections.

### 2.2.8 Electrical Tape

Pressure-sensitive vinyl plastic electrical tape shall conform to UL 510.

### 2.2.9 Permanent Reference Electrodes

Permanent reference electrodes shall be Cu-CuSO<sub>4</sub> electrodes suitable for direct burial. Electrodes shall be guaranteed by the supplier for 15 years' service in the environment in which they shall be placed. Electrodes shall be installed directly beneath pipe.

## PART 3 EXECUTION

### 3.1 CRITERIA OF PROTECTION

Acceptance criteria for determining the adequacy of protection on a buried underground pipe or metallic component shall be in accordance with NACE RP0169 and as specified below.

#### 3.1.1 Iron and Steel

The following method (a) shall be used for testing cathodic protection voltages. If more than one method is required, method (b) shall be used.

a. A negative voltage of at least minus 1000 millivolts as measured between the underground component and a saturated copper-copper sulphate reference electrode connecting the earth (electrolyte) directly over the underground component. Determination of this voltage shall be made with the cathodic protection system in operation. Voltage drops shall be considered for valid interpretation of this voltage measurement. A minimum of minus 1000 millivolts "instant off" potential between the underground component being tested and the reference cell shall be achieved over 95 percent of the area of the structure. Adequate number of measurements shall be obtained over the entire structure, pipe, or other metallic component to verify and record achievement of minus 1000 millivolts "instant off." This potential shall be obtained over 95 percent of the total metallic area.

b. For any metallic component, a minimum of four (4) measurements shall be made using subparagraph (a), above, and achieving the "instant off" potential of minus 850 millivolts. Two (2) measurements shall be made over the anodes and two (2) measurements shall be made at different locations near the component and farthest away from the anode.

### 3.2 ANODE STORAGE AND INSTALLATION

#### 3.2.1 Anode Storage

Storage area for magnesium anodes will be designated by the Contracting Officer. If anodes are not stored in a building, tarps or similar protection should be used to protect anodes from inclement weather. Packaged anodes, damaged as a result of improper handling or being exposed to rain, shall be resacked by the Contractor and the required backfill added.

#### 3.2.2 Anode Installation

Unless otherwise authorized, installation shall not proceed without the presence of the Contracting Officer. Anodes of the size specified shall be installed to the depth indicated and at the locations shown. Locations may be changed to clear obstructions with the approval of the Contracting Officer. Anodes shall be installed in sufficient number and of the required type, size, and spacing to obtain a uniform current distribution over the surface of the structure. The anode system shall be designed for a life of 25 years of continuous operation. Anodes shall be installed as indicated in a dry condition after any plastic or waterproof protective covering has been completely removed from the water permeable, permanent container housing the anode metal. The anode connecting wire shall not be used for lowering the anode into the hole. The annular space around the anode shall be backfilled with fine earth in 6 inch layers and each layer shall be hand tamped. Care must be exercised not to strike the anode or connecting wire with the tamper. Approximately 5 gallons of water shall be applied to each filled hole after anode backfilling and tamping has been completed to a point about 6 inches above the anode. After the water has been absorbed by the earth, backfilling shall be completed to the ground surface level.

##### 3.2.2.1 Single Anodes

Single anodes, spaced as shown, shall be connected through a test station to the pipeline or component, allowing adequate slack in the connecting wire to compensate for movement during backfill operation.

##### 3.2.2.2 Welding Methods

Connections to ferrous pipe or components shall be made by exothermic weld methods manufactured for the type of pipe supplied. Electric arc welded connections and other types of welded connections to ferrous pipe and structures shall be approved before use.

##### 3.2.3 Anode Placement - General

Packaged anodes shall be installed completely dry, and shall be lowered into holes by rope sling or by grasping the cloth gather. The anode lead wire shall not be used in lowering the anodes. The hole shall be backfilled with fine soil in 6 inch layers and each layer shall be hand-tamped around the anode. Care must be exercised not to strike the anode or lead wire with the tamper. If immediate testing is to be performed, water shall be added only after backfilling and tamping has been completed to a point 6 inches above the anode. Approximately 5 gallons of water may be poured into the hole. After the water has been absorbed by the soil, backfilling and tamping may be completed to the top of the hole. Anodes shall be

installed as specified or shown. In the event a rock strata is encountered prior to achieving specified augered-hole depth, anodes may be installed horizontally to a depth at least as deep as the bottom of the pipe, with the approval of the Contracting Officer.

#### 3.2.4 Underground Pipeline

Anodes shall be installed at a minimum of 3 feet and a maximum of 10 feet from the line to be protected.

#### 3.2.5 Installation Details

Details shall conform to the requirements of this specification. Details shown on the drawings are indicative of the general type of material required, and are not intended to restrict selection to material of any particular manufacturer.

#### 3.2.6 Lead Wire Connections

##### 3.2.6.1 Underground Pipeline (Metallic)

To facilitate periodic electrical measurements during the life of the sacrificial anode system and to reduce the output current of the anodes, if required, all anode lead wires shall be connected to a test station and buried a minimum of 24 inches in depth. The cable shall be No. 12 AWG, stranded copper, polyethylene, TW or RHW-USE insulated cable. The cable shall make contact with the structure only through a test station. Lead wire-to-structure connections shall be accomplished by an exothermic welding process. All welds shall be in accordance with the manufacturer's recommendations. A backfill shield filled with a pipeline mastic sealant or material compatible with the coating shall be placed over the weld connection and shall be of such diameter as to cover the exposed metal adequately.

#### 3.2.7 Location of Test Stations

Test stations shall be of the type and location shown and shall be curb box mounted. Buried insulating joints shall be provided with test wire connections brought to a test station. Unless otherwise shown, other test stations shall be located as follows:

At each pipe or component.

#### 3.2.8 Underground Pipe Joint Bonds

Underground pipe having other than welded or threaded coupling joints shall be made electrically continuous by means of a bonding connection installed across the joint.

### 3.3 ELECTRICAL ISOLATION OF STRUCTURES

#### 3.3.1 Isolation Joints and Fittings

Isolating fittings, including main line isolating flanges and couplings, shall be installed aboveground, or within manholes, wherever possible. Where isolating joints must be covered with soil, they shall be fitted with a paper joint cover specifically manufactured for covering the particular joint, and the space within the cover filled with hot coal-tar enamel. Isolating fittings in lines entering buildings shall be located at least

12 inches above grade of floor level, when possible.

### 3.4 TESTS AND MEASUREMENTS

#### 3.4.1 Baseline Potentials

Each test and measurement will be witnessed by the Contracting Officer. The Contractor shall notify the Contracting Officer a minimum of five (5) working days prior to each test. After backfill of the pipe or component, the static potential-to-soil of the pipe or component shall be measured. The locations of these measurements shall be identical to the locations specified for pipe-to-reference electrode potential measurements. The initial measurements shall be recorded.

#### 3.4.2 Isolation Testing

Before the anode system is connected to the pipe, an isolation test shall be made at each isolating joint or fitting. This test shall demonstrate that no metallic contact, or short circuit exists between the two isolated sections of the pipe. Any isolating fittings installed and found to be defective shall be reported to the Contracting Officer.

##### 3.4.2.1 Insulation Checker

A Model 601 insulation checker, as manufactured by "Gas Electronics", or an approved equal, using the continuity check circuit, shall be used for isolating joint (flange) electrical testing. Testing shall conform to the manufacturer's operating instructions. Test shall be witnessed by the Contracting Officer. An isolating joint that is good will read full scale on the meter. If an isolating joint is shorted, the meter pointer will be deflected or near zero on the meter scale. Location of the fault shall be determined from the instructions, and the joint shall be repaired. If an isolating joint is located inside a vault, the pipe shall be sleeved with insulator when entering and leaving the vault.

#### 3.4.3 Anode Output

As the anodes or groups of anodes are connected to the pipe or component tank, current output shall be measured with an approved clamp-on milliammeter, calibrated shunt with a suitable millivoltmeter or multimeter, or a low resistance ammeter. (Of the three methods, the low-resistance ammeter is the least desirable and most inaccurate. The clamp-on milliammeter is the most accurate.) The valves obtained and the date, time, and location shall be recorded.

#### 3.4.4 Reference Electrode Potential Measurements

Upon completion of the installation and with the entire cathodic protection system in operation, electrode potential measurements shall be made using a copper-copper sulphate reference electrode and a potentiometer-voltmeter, or a direct-current voltmeter having an internal resistance (sensitivity) of not less than 10 megohms per volt and a full scale of 10 volts. The locations of these measurements shall be identical to the locations used for baseline potentials. The values obtained and the date, time, and locations of measurements shall be recorded. No less than two (2) measurements shall be made over any length of line or component. Additional measurements shall be made at each distribution service riser, with the reference electrode placed directly over the service line.

### 3.4.5 Location of Measurements

#### 3.4.5.1 Piping or Conduit

For coated piping or conduit, measurements shall be taken from the reference electrode located in contact with the earth, directly over the pipe. Connection to the pipe shall be made at service risers, valves, test leads, or by other means suitable for test purposes. Pipe-to-soil potential measurements shall be made at intervals not exceeding 5 feet. The Contractor may use a continuous pipe-to-soil potential profile in lieu of 5 foot interval pipe-to-soil potential measurements. Additional measurements shall be made at each distribution service riser, with the reference electrode placed directly over the service line adjacent to the riser. Potentials shall be plotted versus distance to an approved scale. Locations where potentials do not meet or exceed the criteria shall be identified and reported to the Contracting Officer's representative.

#### 3.4.5.2 Holiday Test

Any damage to the protective covering during transit and handling shall be repaired before installation. After field-coating and wrapping has been applied, the entire pipe shall be inspected by an electric holiday detector with impressed current in accordance with NACE RP0188 using a full-ring, spring-type coil electrode. The holiday detector shall be equipped with a bell, buzzer, or other type of audible signal which sounds when a holiday is detected. Holidays in the protective covering shall be repaired upon detection. Occasional checks of holiday detector potential will be made by the Contracting Officer to determine suitability of the detector. Labor, materials, and equipment necessary for conducting the inspection shall be furnished by the Contractor. The coating system shall be inspected for holes, voids, cracks, and other damage during installation.

#### 3.4.5.3 Recording Measurements

All pipe-to-soil potential measurements, including initial potentials where required, shall be recorded. The Contractor shall locate, correct and report to the Contracting Officer any short circuits to foreign pipes encountered during checkout of the installed cathodic protection system. Pipe-to-soil potential measurements shall be taken on as many pipes or components as necessary to determine the extent of protection or to locate short-circuits.

### 3.5 TRAINING COURSE

The Contractor shall conduct a training course for the operating staff as designated by the Contracting Officer. The training period shall consist of a total of 4 hours of normal working time and shall start after the system is functionally completed but prior to final acceptance tests. The field instructions shall cover all of the items contained in the operating and maintenance instructions, as well as demonstrations of routine maintenance operations, including testing procedures included in the maintenance instructions. At least 14 days prior to date of proposed conduction of the training course, the training course curriculum shall be submitted for approval, along with the proposed training date. Training shall consist of demonstration of test equipment, providing forms for test data and the tolerances which indicate that the system works.

### 3.6 CLEANUP

The Contractor shall be responsible for cleanup of the construction site. All paper bags, wire clippings, etc., shall be disposed of as directed. Paper bags, wire clippings and other waste shall not be put in bell holes or anodes excavation.

### 3.7 MISCELLANEOUS INSTALLATION AND TESTING

#### 3.7.1 Coatings

All aboveground pipeline shall be coated as indicated or as approved. The coating shall have a minimum thickness of 7 mil. The pipeline coating shall be in accordance with all applicable Federal, State, and local regulations.

#### 3.7.2 Excavation

In the event rock is encountered in providing the required depth for anodes, the Contractor shall determine an alternate approved location and, if the depth is still not provided, an alternate plan shall be submitted to the Contracting Officer. Alternate techniques and depths must be approved prior to implementation.

### 3.8 SPARE PARTS

After approval of shop drawings, and not later than three (3) months prior to the date of beneficial occupancy, the Contractor shall furnish spare parts data for each different item of material and equipment specified. The data shall include a complete list of parts, special tools, and supplies, with current unit prices and source of supply. In addition, the Contractor shall supply information for material and equipment replacement for all other components of the complete system, including anodes, cables, splice kits and connectors, corrosion test stations, and any other components not listed above.

### 3.9 SYSTEM TESTING

The Contractor shall submit a report including potential measurements taken at adequately-close intervals to establish that minus 1000 millivolts potential, "instant-off" potential, is provided, and that the cathodic protection is not providing interference to other foreign pipes causing damage to paint or pipes. The report shall provide a narrative describing how the criteria of protection is achieved without damaging other pipe or structures in the area.

-- End of Section --

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## SECTION 13851A

FIRE DETECTION AND ALARM SYSTEM, ADDRESSABLE  
**02/02**

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI S3.41 (1990; R 1996) Audible Emergency  
Evacuation Signal

## INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41 (1991) Recommended Practice for Surge  
Voltages in Low-Voltage AC Power Circuits

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 1221 (1999) Installation, Maintenance and Use  
of Public Fire Service Communication  
Systems

NFPA 70 (2002) National Electrical Code

NFPA 72 (2002) National Fire Alarm Code

NFPA 90A (2002) Installation of Air Conditioning  
and Ventilating Systems

## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

47 CFR 15 Radio Frequency Devices

## UNDERWRITERS LABORATORIES (UL)

UL 1242 (1996; Rev Mar 1998) Intermediate Metal  
Conduit

UL 1971 (1995; Rev thru Apr 1999) Signaling  
Devices for the Hearing Impaired

UL 228 (1997; Rev Jan 1999) Door Closers-Holders,  
With or Without Integral Smoke Detectors

UL 268 (1996; Rev thru Jan 1999) Smoke Detectors  
for Fire Protective Signaling Systems

UL 268A (1998; Rev thru Apr 2003) Smoke Detectors  
for Duct Application

UL 38	(1999) Manually Actuated Signaling Boxes for Use with Fire-Protective Signaling Systems
UL 464	(1996; Rev thru May 1999) Audible Signal Appliances
UL 521	(1999) Heat Detectors for Fire Protective Signaling Systems
UL 6	(1997) Rigid Metal Conduit
UL 797	(1993; Rev thru Mar 1997) Electrical Metallic Tubing
UL 864	(1996; Rev thru Mar 1999) Control Units for Fire Protective Signaling Systems

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-02 Shop Drawings

#### Fire Alarm Reporting System; G-AE

Detail drawings, prepared and signed by a Registered Professional Engineer or a NICET Level 4 Fire Alarm Technician, consisting of a complete list of equipment and material, including manufacturer's descriptive and technical literature, catalog cuts, and installation instructions. Note that the contract drawings show layouts based on typical detectors. The Contractor shall check the layout based on the actual detectors to be installed and make any necessary revisions in the detail drawings. The detail drawings shall also contain complete wiring and schematic diagrams for the equipment furnished, equipment layout, and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Detailed point-to-point wiring diagram shall be prepared and signed by a Registered Professional Engineer or a NICET Level 4 Fire Alarm Technician showing points of connection. Diagram shall include connections between system devices, appliances, control panels, supervised devices, and equipment that is activated or controlled by the panel.

### SD-03 Product Data

#### Storage Batteries; G-AE

Substantiating battery calculations for supervisory and alarm power requirements. Ampere-hour requirements for each system component and each panel component, and the battery recharging period shall be included.

#### Voltage Drop; G-AE

Voltage drop calculations for notification appliance circuits to indicate that sufficient voltage is available for proper appliance operation.

#### Special Tools and Spare Parts; G-AE

Spare parts data for each different item of material and equipment specified, not later than 3 months prior to the date of beneficial occupancy. Data shall include a complete list of parts and supplies with the current unit prices and source of supply and a list of the parts recommended by the manufacturer to be replaced after 1 year of service.

#### Technical Data and Computer Software; G-AE

Technical data which relates to computer software.

#### Training; G-AE

Lesson plans, operating instructions, maintenance procedures, and training data, furnished in manual format, for the training courses. The operations training shall familiarize designated government personnel with proper operation of the fire alarm system. The maintenance training course shall provide the designated government personnel adequate knowledge required to diagnose, repair, maintain, and expand functions inherent to the system.

#### Testing; G-AE

Detailed test procedures, prepared and signed by a Registered Professional Engineer or a NICET Level 4 Fire Alarm Technician, for the fire detection and alarm system 60 days prior to performing system tests.

### SD-06 Test Reports

#### Testing; G-AE

Test reports, in booklet form, showing field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Each test report shall document readings, test results and indicate the final position of controls. The Contractor shall include the NFPA 72 Certificate of Completion and NFPA 72 Inspection and Testing Form, with the appropriate test reports.

### SD-07 Certificates

#### Equipment; G-AE

Certified copies of current approvals or listings issued by an independent test lab if not listed by UL, FM or other nationally recognized testing laboratory, showing compliance with specified NFPA standards.

#### Qualifications; G-AE

Proof of qualifications for required personnel. The installer shall submit proof of experience for the Professional Engineer, fire alarm technician, and the installing company.

#### SD-10 Operation and Maintenance Data

##### Technical Data and Computer Software; G-AE

Six copies of operating manual outlining step-by-step procedures required for system startup, operation, and shutdown. The manual shall include the manufacturer's name, model number, service manual, parts list, and complete description of equipment and their basic operating features. Six copies of maintenance manual listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide. The manuals shall include conduit layout, equipment layout and simplified wiring, and control diagrams of the system as installed. The manuals shall include complete procedures for system revision and expansion, detailing both equipment and software requirements. Original and backup copies of all software delivered for this project shall be provided, on each type of media utilized. Manuals shall be approved prior to training.

### 1.3 GENERAL REQUIREMENTS

#### 1.3.1 Standard Products

Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 2 years prior to bid opening. Equipment shall be supported by a service organization that can provide service within 24 hours of notification.

#### 1.3.2 Nameplates

Major components of equipment shall have the manufacturer's name, address, type or style, voltage and current rating, and catalog number on a noncorrosive and nonheat-sensitive plate which is securely attached to the equipment.

#### 1.3.3 Keys and Locks

Locks shall be keyed alike. Four keys for the system shall be provided.

#### 1.3.4 Tags

Tags with stamped identification number shall be furnished for keys and locks.

#### 1.3.5 Verification of Dimensions

After becoming familiar with details of the work, the Contractor shall verify dimensions in the field and shall advise the Contracting Officer of any discrepancy before performing the work.

#### 1.3.6 Compliance

The fire detection and alarm system and the central reporting system shall

be configured in accordance with NFPA 72; exceptions are acceptable as directed by the Contracting Officer. The equipment furnished shall be compatible and be UL listed, FM approved, or approved or listed by a nationally recognized testing laboratory in accordance with the applicable NFPA standards.

#### 1.3.7 Qualifications

##### 1.3.7.1 Engineer and Technician

a. Registered Professional Engineer with verification of experience and at least 4 years of current experience in the design of the fire protection and detection systems.

b. National Institute for Certification in Engineering Technologies (NICET) qualifications as an engineering technician in fire alarm systems program with verification of experience and current NICET certificate.

c. The Registered Professional Engineer may perform all required items under this specification. The NICET Fire Alarm Technician shall perform only the items allowed by the specific category of certification held.

##### 1.3.7.2 Installer

The installing Contractor shall provide the following: NICET Fire Alarm Technicians to perform the installation of the system. A NICET Level 4 Fire Alarm Technician shall supervise the installation of the fire alarm system. NICET Level 2 or higher Fire Alarm Technician shall install and terminate fire alarm devices, cabinets and panels. An electrician or NICET Level 1 Fire Alarm Technician shall install conduit for the fire alarm system. The Fire Alarm technicians installing the equipment shall be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

##### 1.3.7.3 Design Services

Installations requiring designs or modifications of fire detection, fire alarm, or fire suppression systems shall require the services and review of a qualified fire protection engineer. For the purposes of meeting this requirement, a qualified fire protection engineer is defined as an individual meeting one of the following conditions:

- a. An engineer having a Bachelor of Science or Masters of Science Degree in Fire Protection Engineering from an accredited university engineering program, plus a minimum of 2 years' work experience in fire protection engineering.
- b. A registered professional engineer (P.E.) in fire protection engineering.
- c. A registered PE in a related engineering discipline and member grade status in the National Society of Fire Protection Engineers.
- d. An engineer with a minimum of 10 years' experience in fire protection engineering and member grade status in the National Society of Fire Protection Engineers.

## 1.4 SYSTEM DESIGN

### 1.4.1 Operation

The fire alarm and detection system and equipment shall be a complete, supervised fire alarm reporting system. The system shall be activated into the alarm mode by actuation of any alarm initiating device. The system shall remain in the alarm mode until the initiating device is reset and the fire alarm control panel is reset and restored to normal. Alarm initiating devices shall be connected to initiating device circuits (IDC), Class A, Style D, to signal line circuits (SLC) Class A, Style 6, in accordance with NFPA 72. Alarm notification appliances shall be connected to notification appliance circuits (NAC), Class A Style Z in accordance with NFPA 72. A looped conduit system shall be provided so that if the conduit and all conductors within are severed at any point, all IDC, NAC and SLC will remain functional. The conduit loop requirement is not applicable to the signal transmission link from the local panels (at the protected premises) to the Supervising Station (fire station, fire alarm central communication center). Textual, audible, and visual appliances and systems shall comply with NFPA 72. Fire alarm system components requiring power, except for the control panel power supply, shall operate on 24 Volts dc. Addressable system shall be microcomputer (microprocessor or microcontroller) based with a minimum word size of eight bits and shall provide the following features:

- a. Sufficient memory to perform as specified and as shown for addressable system.
- b. Individual identity of each addressable device for the following conditions: alarm; trouble; open; short; and appliances missing/failed remote detector - sensitivity adjustment from the panel for smoke detectors
- c. Capability of each addressable device being individually disabled or enabled from the panel.
- d. Each SLC shall be sized to provide 40 percent addressable expansion without hardware modifications to the panel.

### 1.4.2 Operational Features

The system shall have the following operating features:

- a. Monitor electrical supervision of IDC, SLC, and NAC.
- b. Monitor electrical supervision of the primary power (ac) supply, battery voltage, placement of alarm zone module (card, PC board) within the control panel, and transmitter tripping circuit integrity.
- c. A trouble buzzer and trouble LED/LCD (light emitting diode/liquid crystal diode) to activate upon a single break, open, or ground fault condition which prevents the required normal operation of the system. The trouble signal shall also operate upon loss of primary power (ac) supply, low battery voltage, removal of alarm zone module (card, PC board), and disconnection of the circuit used for transmitting alarm signals off-premises. A trouble alarm silence switch shall be provided which will silence the trouble buzzer, but will not extinguish the trouble indicator LED/LCD.

Subsequent trouble and supervisory alarms shall sound the trouble signal until silenced. After the system returns to normal operating conditions, the trouble buzzer shall again sound until the silencing switch returns to normal position, unless automatic trouble reset is provided.

- d. A one person test mode. Activating an initiating device in this mode will activate an alarm for a short period of time, then automatically reset the alarm, without activating the transmitter during the entire process.
- e. A transmitter disconnect switch to allow testing and maintenance of the system without activating the transmitter but providing a trouble signal when disconnected and a restoration signal when reconnected.
- f. Evacuation alarm silencing switch which, when activated, will silence alarm devices, but will not affect the zone indicating LED/LCD nor the operation of the transmitter. This switch shall be over-ridden upon activation of a subsequent alarm from an unalarmed device and the NAC devices will be activated.
- g. Electrical supervision for circuits used for supervisory signal services (i.e., sprinkler systems, valves, etc.). Supervision shall detect any open, short, or ground.
- h. Confirmation or verification of all smoke detectors. The control panel shall interrupt the transmission of an alarm signal to the system control panel for a factory preset period. This interruption period shall be adjustable from 1 to 60 seconds and be factory set at 20 seconds. Immediately following the interruption period, a confirmation period shall be in effect during which time an alarm signal, if present, will be sent immediately to the control panel. Fire alarm devices other than smoke detectors shall be programmed without confirmation or verification.
- i. The fire alarm control panel shall provide supervised addressable relays for HVAC shutdown. An override at the HVAC panel shall not be provided.
- j. Provide one person test mode - Activating an initiating device in this mode will activate an alarm for a short period of time, then automatically reset the alarm, without activating the transmitter during the entire process.
- k. The fire alarm control panel shall provide the required monitoring and supervised control outputs needed to accomplish elevator recall.
- l. The fire alarm control panel shall monitor the fire sprinkler system, or other fire protection extinguishing system.
- m. The control panel and field panels shall be software reprogrammable to enable expansion or modification of the system without replacement of hardware or firmware. Examples of required changes are: adding or deleting devices or zones; changing system responses to particular input signals; programming certain input signals to activate auxiliary devices.

- n. Zones for IDC and NAC shall be arranged as indicated on the contract drawings.

#### 1.4.3 Alarm Functions

An alarm condition on a circuit shall automatically initiate the following functions:

- a. Transmission of a signal over the station radio fire reporting system. The signal shall be common for any device.
- b. Visual indications of the alarmed devices on the fire alarm control panel display.
- c. Continuous sounding or operation of alarm notification appliances throughout the building as required by ANSI S3.41.
- d. Closure of doors held open by electromagnetic devices.
- e. Operation of the smoke control system.
- f. Deactivation of the air handling units throughout the building.
- g. Shutdown of power to the data processing equipment in the alarmed area.

#### 1.4.4 Primary Power

Operating power shall be provided as required by paragraph Power Supply for the System. Transfer from normal to emergency power or restoration from emergency to normal power shall be fully automatic and not cause transmission of a false alarm. Loss of ac power shall not prevent transmission of a signal via the fire reporting system upon operation of any initiating circuit. Conductors for power shall be sized to account for voltage drop

#### 1.4.5 Battery Backup Power

Battery backup power shall be through use of rechargeable, sealed-type storage batteries and battery charger.

#### 1.4.6 Interface With other Equipment

Interfacing components shall be furnished as required to connect to subsystems or devices which interact with the fire alarm system, such as supervisory or alarm contacts in suppression systems, operating interfaces for smoke control systems, deluge fire suppression systems and electrically operated valves.

### 1.5 TECHNICAL DATA AND COMPUTER SOFTWARE

Technical data and computer software (meaning technical data which relates to computer software) which is specifically identified in this project, and which may be defined/required in other specifications, shall be delivered, strictly in accordance with the CONTRACT CLAUSES, and in accordance with the Contract Data Requirements List, DD Form 1423. Data delivered shall be identified by reference to the particular specification paragraph against which it is furnished. Data to be submitted shall include complete system,



equipment, and software descriptions. Descriptions shall show how the equipment will operate as a system to meet the performance requirements of this contract. The data package shall also include the following:

- (1) Identification of programmable portions of system equipment and capabilities.
- (2) Description of system revision and expansion capabilities and methods of implementation detailing both equipment and software requirements.
- (3) Provision of operational software data on all modes of programmable portions of the fire alarm and detection system.
- (4) Description of Fire Alarm Control Panel equipment operation.
- (5) Description of auxiliary and remote equipment operations.
- (6) Library of application software.
- (7) Operation and maintenance manuals as specified in SD-19 of the Submittals paragraph.

#### 1.6 DELIVERY AND STORAGE

Equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variation, dirt, dust, and any other contaminants.

### PART 2 PRODUCTS

#### 2.1 CONTROL PANEL

Control Panel shall comply with the applicable requirements of UL 864. Panel shall be modular, installed in a surface mounted steel cabinet with hinged door and cylinder lock. Control panel shall be a clean, uncluttered, and orderly assembled panel containing components and equipment required to provide the specified operating and supervisory functions of the system. The panel shall have prominent rigid plastic, phenolic or metal identification plates for LED/LCDs, zones, SLC, controls, meters, fuses, and switches. Nameplates for fuses shall also include ampere rating. The LED/LCD displays shall be located on the exterior of the cabinet door or be visible through the cabinet door. Control panel switches shall be within the locked cabinet. A suitable means (single operation) shall be provided for testing the control panel visual indicating devices (meters or LEDs/LCDs). Meters and LEDs shall be plainly visible when the cabinet door is closed. Signals and LEDs/LCDs shall be provided to indicate by zone any alarm, supervisory or trouble condition on the system. Each IDC shall be powered and supervised so that a signal on one zone does not prevent the receipt of signals from other devices. Loss of power, including batteries, shall not require the manual reloading of a program. Upon restoration of power, startup shall be automatic, and shall not require any manual operation. The loss of primary power or the sequence of applying primary or emergency power shall not affect the transmission of alarm, supervisory or trouble signals. Visual annunciation shall be provided for LED/LCD visual display as an integral part of the control panel and shall identify with a word description and id number each device. Cabinets shall be provided with ample gutter space to allow proper clearance between the cabinet and live parts of the panel equipment. If

more than one modular unit is required to form a control panel, the units shall be installed in a single cabinet large enough to accommodate units. Cabinets shall be painted red.

#### 2.1.1.1 Remote System Audible/Visual Display

Audible appliance shall have a minimum sound level output rating of 85 dBA at 10 feet and operate in conjunction with the panel integral display. The audible device shall be silenced by a system silence switch on the remote system. The audible device shall be silenced by the system silence switch located at the remote location, but shall not extinguish the visual indication. The remote LED/LCD visual display shall provide identification, consisting of the word description and id number for each device as displayed on the control panel. A rigid plastic, phenolic or metal identification sign which reads "Fire Alarm System Remote Display" shall be provided at the remote audible/visual display. The remote visual appliance located with the audible appliance shall not be extinguished until the trouble or alarm has been cleared.

#### 2.1.1.2 Circuit Connections

Circuit conductors entering or leaving the panel shall be connected to screw-type terminals with each conductor and terminal marked for identification.

#### 2.1.1.3 System Expansion and Modification Capabilities

Any equipment and software needed by qualified technicians to implement future changes to the fire alarm system shall be provided as part of this contract.

#### 2.1.1.4 Addressable Control Module

The control module shall be capable of operating as a relay (dry contact form C) for interfacing the control panel with other systems, and to control door holders or initiate elevator fire service. The module shall be UL listed as compatible with the control panel. The indicating device or the external load being controlled shall be configured as a Style Y notification appliance circuits. The system shall be capable of supervising, audible, visual and dry contact circuits. The control module shall have both an input and output address. The supervision shall detect a short on the supervised circuit and shall prevent power from being applied to the circuit. The control module shall provide address setting means compatible with the control panel's SLC supervision and store an internal identifying code. The control module shall contain an integral LED that flashes each time the control module is polled.

#### 2.1.1.5 Addressable Initiating Device Circuits Module

The initiating device being monitored shall be configured as a Style D initiating device circuits. The system shall be capable of defining any module as an alarm module and report alarm trouble, loss of polling, or as a supervisory module, and reporting supervisory short, supervisory open or loss of polling. The module shall be UL listed as compatible with the control panel. The monitor module shall provide address setting means compatible with the control panel's SLC supervision and store an internal identifying code. Monitor module shall contain an integral LED that flashes each time the monitor module is polled. Pull stations with a monitor module in a common backbox are not required to have an LED.

## 2.2 STORAGE BATTERIES

Storage batteries shall be provided and shall be 24 Vdc sealed, lead-calcium type requiring no additional water. The batteries shall have ample capacity, with primary power disconnected, to operate the fire alarm system for a period of 72 hours. Following this period of battery operation, the batteries shall have ample capacity to operate all components of the system, including all alarm signaling devices in the total alarm mode for a minimum period of 15 minutes. Batteries shall be located at the bottom of the panel. Batteries shall be provided with overcurrent protection in accordance with NFPA 72. Separate battery cabinets shall have a lockable, hinged cover similar to the fire alarm panel. The lock shall be keyed the same as the fire alarm control panel. Cabinets shall be painted to match the fire alarm control panel.

## 2.3 BATTERY CHARGER

Battery charger shall be completely automatic, 24 Vdc with high/low charging rate, capable of restoring the batteries from full discharge (18 Volts dc) to full charge within 48 hours. A pilot light indicating when batteries are manually placed on a high rate of charge shall be provided as part of the unit assembly, if a high rate switch is provided. Charger shall be located in control panel cabinet or in a separate battery cabinet.

## 2.4 ADDRESSABLE MANUAL FIRE ALARM STATIONS

Addressable manual fire alarm stations shall conform to the applicable requirements of UL 38. Manual stations shall be connected into signal line circuits. Stations shall be installed on flush mounted outlet boxes. Manual stations shall be mounted at 48 inches. Stations shall be double action type. Stations shall be finished in red, with raised letter operating instructions of contrasting color. Stations requiring the breaking of glass or plastic panels for operation are not acceptable. Stations employing glass rods are not acceptable. The use of a key or wrench shall be required to reset the station. Gravity or mercury switches are not acceptable. Switches and contacts shall be rated for the voltage and current upon which they operate. Addressable pull stations shall be capable of being field programmed, shall latch upon operation and remain latched until manually reset. Stations shall have a separate screw terminal for each conductor. Surface mounted boxes shall be matched and painted the same color as the fire alarm manual stations.

## 2.5 FIRE DETECTING DEVICES

Fire detecting devices shall comply with the applicable requirements of NFPA 72, NFPA 90A, UL 268, UL 268A, and UL 521. The detectors shall be provided as indicated. Detector base shall have screw terminals for making connections. No solder connections will be allowed. Detectors located in concealed locations (above ceiling, raised floors, etc.) shall have a remote visible indicator LED/LCD. Addressable fire detecting devices, except flame detectors, shall be dynamically supervised and uniquely identified in the control panel. All fire alarm initiating devices shall be individually addressable, except where indicated. Installed devices shall conform to NFPA 70 hazard classification of the area where devices are to be installed.

### 2.5.1 Heat Detectors

Heat detectors shall be designed for detection of fire by combination fixed temperature and rate-of-rise principle. Heat detector spacing shall be rated in accordance with UL 521. Detectors located in areas subject to moisture, exterior atmospheric conditions, or hazardous locations as defined by NFPA 70 and as shown on drawings, shall be types approved for such locations. Heat detectors located in attic spaces or similar concealed spaces below the roof shall be intermediate temperature rated.

#### 2.5.1.1 Combination Fixed-Temperature and Rate-of-Rise Detectors

Detectors shall be designed for surface outlet box mounting and supported independently of wiring connections. Contacts shall be self-resetting after response to rate-of-rise principle. Under fixed temperature actuation, the detector shall have a permanent external indication which is readily visible. Detector units located in boiler rooms, showers, or other areas subject to abnormal temperature changes shall operate on fixed temperature principle only. The UL 521 test rating for the fixed temperature portion shall be 135 degrees F. The UL 521 test rating for the Rate-of-Rise detectors shall be rated for 50 by 50 ft.

#### 2.5.1.2 Fixed Temperature Detectors

Detectors shall be designed for surface outlet box mounting and supported independently of wiring connections. Detectors shall be designed to detect high heat. The detectors shall have a specific temperature setting of 135 degrees F. The UL 521 test rating for the fixed temperature detectors shall be rated for 15 by 15 ft.

### 2.5.2 Smoke Detectors

Smoke detectors shall be designed for detection of abnormal smoke densities. Smoke detectors shall be photoelectric or projected beam type. Detectors shall contain a visible indicator LED/LCD that shows when the unit is in alarm condition. Detectors shall not be adversely affected by vibration or pressure. Detectors shall be the plug-in type in which the detector base contains terminals for making wiring connections. Detectors that are to be installed in concealed (above false ceilings, etc.) locations shall be provided with a remote indicator LED/LCD suitable for mounting in a finished, visible location.

#### 2.5.2.1 Photoelectric Detectors

Detectors shall operate on a light scattering concept using an LED light source. Failure of the LED shall not cause an alarm condition. Detectors shall be factory set for sensitivity and shall require no field adjustments of any kind. Detectors shall have an obscuration rating in accordance with UL 268. Addressable smoke detectors shall be capable of having the sensitivity being remotely adjusted by the control panel.

#### 2.5.2.2 PVESDA Aspirating Air Sampling Detectors

Detector shall be addressable and high sensitivity aspirating smoke detector that provides early warning in a single environment. The detector shall interface directly with the fire alarm control panel via the MAPNET and/or IDNet Signaling Line Circuits (SLC's). All field wiring shall terminate to the unit on terminal blocks located internally on the termination card. The detector shall provide one RS-232 port for

communications with the VESDA VConfig programming software. Each detector is allocated a unique address via a dip switch located on the detector termination card. VESDA detectors shall provide shutdown signal to air handling equipment in simulator areas.

#### 2.5.2.3 Duct Detectors

Duct-mounted photoelectric smoke detectors shall be furnished and installed where indicated and in accordance with NFPA 90A. Units shall consist of a smoke detector as specified in paragraph Photoelectric Detectors, mounted in a special housing fitted with duct sampling tubes. Detector circuitry shall be mounted in a metallic enclosure exterior to the duct. Detectors shall have a manual reset. Detectors shall be rated for air velocities that include air flows between 500 and 4000 fpm. Detectors shall be powered from the fire alarm panel. Sampling tubes shall run the full width of the duct. The duct detector package shall conform to the requirements of NFPA 90A, UL 268A, and shall be UL listed for use in air-handling systems. The control functions, operation, reset, and bypass shall be controlled from the fire alarm control panel. Lights to indicate the operation and alarm condition; and the test and reset buttons shall be visible and accessible with the unit installed and the cover in place. Detectors mounted above 6 feet and those mounted below 6 feet that cannot be easily accessed while standing on the floor, shall be provided with a remote detector indicator panel containing test and reset switches. Remote lamps and switches as well as the affected fan units shall be properly identified in etched plastic placards. Detectors shall have auxiliary contacts to provide control, interlock, and shutdown functions specified in Division 15. The detectors shall be supplied by the fire alarm system manufacturer to ensure complete system compatibility.

#### 2.5.3 Combination Smoke and Heat Detectors

Combination smoke and heat detectors shall have an audible device (self-contained) and be designed for detection of abnormal smoke densities by the photoelectric principle and abnormal heat by a fixed temperature sensor. Smoke detectors shall be provided with an LED light source. Failure of the LED shall not cause an alarm condition and the sensitivity shall be factory set at a nominal 3 percent and require no field adjustments of any kind. Heat detector portion shall be fixed temperature sensor rated at 135 degrees F. The audible appliances shall have a minimum sound output of at least 85 dBA at 10 feet. Detectors shall contain a visible indicator LED that shows when the unit is in alarm condition. Detectors shall not be adversely affected by vibration or pressure. Heat detectors shall connect to a control panel IDC and shall be self restorable.

### 2.6 NOTIFICATION APPLIANCES

Audible appliances shall conform to the applicable requirements of UL 464. Devices shall be connected into notification appliance circuits. Devices shall have a separate screw terminal for each conductor. Audible appliances shall generate a unique audible sound from other devices provided in the building and surrounding area. Surface mounted audible appliances shall be painted red. Recessed audible appliances shall be installed with a grill that is painted red.

#### 2.6.1 Alarm Bells

Bells shall be surface mounted with the matching mounting back box surface mounted. Bells shall be suitable for use in an electrically supervised

circuit. Bells shall be the underdome type producing a minimum output rating of 85 dBA at 10 feet. Bells used in exterior locations shall be specifically listed or approved for outdoor use and be provided with metal housing and protective grilles. Single stroke, electrically operated, supervised, solenoid bells shall be used for coded applications.

#### 2.6.2 Alarm Horns

Horns shall be surface mounted, with the matching mounting back box surface mounted single or double projector, vibrating type suitable for use in an electrically supervised circuit. Horns shall produce a sound rating of at least 85 dBA at 10 feet. Horns used in exterior locations shall be specifically listed or approved for outdoor use and be provided with metal housing and protective grilles.

#### 2.6.3 Visual Notification Appliances

Visual notification appliances shall conform to the applicable requirements of UL 1971 and the contract drawings. Appliances shall have clear high intensity optic lens, xenon flash tubes, and output white light. Strobe flash rate shall be between 1 to 3 flashes per second and a minimum of 75 candela. Strobe shall be semi-flush mounted.

#### 2.6.4 Combination Audible/Visual Notification Appliances

Combination audible/visual notification appliances shall provide the same requirements as individual units except they shall mount as a unit in standard backboxes. Units shall be factory assembled. Any other audible notification appliance employed in the fire alarm systems shall be approved by the Contracting Officer.

#### 2.6.5 Voice Evacuation System

The voice evacuation system shall provide for one-way voice communications, routing and pre-amplification of digital alarm tones and voice (digital and analog) messages. The system shall be zoned for messages (Custom and prerecorded) and tones as indicated on the drawings. The following electronic tones shall be available from the amplifier: Slow Whoop, High/Low, Horn, Chime, Beep, Stutter, Wail and Bell. The system shall have a microphone and allow for general paging within the space. Operation shall be either manually from a control switch or automatically from the fire alarm control panel. Reset shall be accomplished by the fire alarm control panel during panel reset.

### 2.7 FIRE DETECTION AND ALARM SYSTEM PERIPHERAL EQUIPMENT

#### 2.7.1 Electromagnetic Door Hold-Open Devices

Devices shall be attached to the walls unless otherwise indicated. Devices shall comply with the appropriate requirements of UL 228. Devices shall operate on 24 Volt dc power. Compatible magnetic component shall be attached to the door. Under normal conditions, the magnets shall attract and hold the doors open. When magnets are de-energized, they shall release the doors. Magnets shall have a holding force of 25 pounds. Devices shall be UL or FM approved. Housing for devices shall be brushed aluminum or stainless steel. Operation shall be fail safe with no moving parts. Electromagnetic door hold-open devices shall not be required to be held open during building power failure.

### 2.7.2 Conduit

Conduit and fittings shall comply with NFPA 70, UL 6, UL 1242, and UL 797.

### 2.7.3 Wiring

Wiring shall conform to NFPA 70. Wiring for 120 Vac power shall be No. 12 AWG minimum. The SLC wiring shall be fiber optic or copper cable in accordance with the manufacturers requirements. Wiring for fire alarm dc circuits shall be No. 14 AWG minimum. Voltages shall not be mixed in any junction box, housing, or device, except those containing power supplies and control relays. Wiring shall conform to NFPA 70. System field wiring shall be solid copper and installed in metallic conduit or electrical metallic tubing, except that rigid plastic conduit may be used under slab-on-grade. Conductors shall be color coded. Conductors used for the same functions shall be similarly color coded. Wiring code color shall remain uniform throughout the circuit. Pigtail or T-tap connections to initiating device circuits, supervisory alarm circuits, and notification appliance circuits are prohibited. T-tapping using screw terminal blocks is allowed for style 5 addressable systems.

### 2.7.4 Special Tools and Spare Parts

Software, connecting cables and proprietary equipment, necessary for the maintenance, testing, and reprogramming of the equipment shall be furnished to the Contracting Officer. Two spare fuses of each type and size required shall be furnished. Two percent of the total number of each different type of detector, but no less than two each, shall be furnished. Spare fuses shall be mounted in the fire alarm panel.

## 2.8 TRANSMITTERS

### 2.8.1 Radio Alarm Transmitters

Transmitters shall be compatible with proprietary supervising station receiving equipment. Each radio alarm transmitter shall be the manufacturer's recognized commercial product, completely assembled, wired, factory tested, and delivered ready for installation and operation. Transmitters shall be provided in accordance with applicable portions of NFPA 72, NFPA 1221, and 47 CFR 15. Transmitter electronics module shall be contained within the physical housing as an integral, removable assembly. The proprietary supervising station receiving equipment is existing and the transceiver shall be fully compatible with this equipment. At the contractors option, and if UL listed, the transmitter may be housed in the same panel as the fire alarm control panel.

#### 2.8.1.1 Transmitter Power Supply

Each radio alarm transmitter shall be powered by a combination of locally available 120-volt ac power and a sealed, lead-calcium battery.

- a. Operation: Each transmitter shall operate from 120-volt ac power. In the event of 120-volt ac power loss, the transmitter shall automatically switch to battery operation. Switchover shall be accomplished with no interruption of protective service, and shall automatically transmit a trouble message. Upon restoration of ac power, transfer back to normal ac power supply shall also be automatic.

b. Battery Power: Transmitter standby battery capacity shall provide sufficient power to operate the transmitter in a normal standby status for a minimum of 72 hours and be capable of transmitting alarms during that period.

#### 2.8.1.2 Radio Alarm Transmitter Housing

Transmitter housing shall be NEMA Type 1. The housing shall contain a lock that is keyed identical to radio alarm transmitter housings on the base. Radio alarm transmitter housing shall be factory painted with a suitable priming coat and not less than two coats of a hard, durable weatherproof enamel.

#### 2.8.1.3 Antenna

The Contractor shall provide omnidirectional, coaxial, halfwave dipole antennas for radio alarm transmitters with a driving point impedance to match transmitter output. The antenna and antenna mounts shall be corrosion resistant and designed to withstand wind velocities of 100 mph. Antennas shall not be mounted to any portion of the building roofing system.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

All work shall be installed as shown, and in accordance with NFPA 70 and NFPA 72, and in accordance with the manufacturer's diagrams and recommendations, unless otherwise specified. Smoke detectors shall not be installed until construction is essentially complete and the building has been thoroughly cleaned.

##### 3.1.1 Power Supply for the System

A single dedicated circuit connection for supplying power from a branch circuit to each building fire alarm system shall be provided. The power shall be supplied as shown on the drawings. The power supply shall be equipped with a locking mechanism and marked in red with the words "FIRE ALARM CIRCUIT CONTROL".

##### 3.1.2 Wiring

Conduit size for wiring shall be in accordance with NFPA 70. Wiring for the fire alarm system shall not be installed in conduits, junction boxes, or outlet boxes with conductors of lighting and power systems. Not more than two conductors shall be installed under any device screw terminal. The wires under the screw terminal shall be straight when placed under the terminal then clamped in place under the screw terminal. The wires shall be broken and not twisted around the terminal. Circuit conductors entering or leaving any mounting box, outlet box enclosure, or cabinet shall be connected to screw terminals with each terminal and conductor marked in accordance with the wiring diagram. Connections and splices shall be made using screw terminal blocks. The use of wire nut type connectors in the system is prohibited. Wiring within any control equipment shall be readily accessible without removing any component parts. The fire alarm equipment manufacturer's representative shall be present for the connection of wiring to the control panel.



### 3.1.3 Control Panel

The control panel and its assorted components shall be mounted so that no part of the enclosing cabinet is less than 12 inches nor more than 78 inches above the finished floor. Manually operable controls shall be between 36 and 42 inches above the finished floor. Panel shall be installed to comply with the requirements of UL 864.

### 3.1.4 Detectors

Detectors shall be located and installed in accordance with NFPA 72. Detectors shall be connected into signal line circuits or initiating device circuits as indicated on the drawings. Detectors shall be at least 12 inches from any part of any lighting fixture. Detectors shall be located at least 3 feet from diffusers of air handling systems. Each detector shall be provided with appropriate mounting hardware as required by its mounting location. Detectors which mount in open space shall be mounted directly to the end of the stubbed down rigid conduit drop. Conduit drops shall be firmly secured to minimize detector sway. Where length of conduit drop from ceiling or wall surface exceeds 3 feet, sway bracing shall be provided. Detectors installed in concealed locations (above ceiling, raised floors, etc.) shall have a remote visible indicator LED/LCD in a finished, visible location.

### 3.1.5 Notification Appliances

Notification appliances shall be mounted 80 inches above the finished floor or 6 inches below the ceiling, whichever is lower.

### 3.1.6 Annunciator Equipment

Annunciator equipment shall be mounted where indicated on the drawings.

### 3.1.7 Addressable Initiating Device Circuits Module

The initiating device circuits module shall be used to connect supervised conventional initiating devices (water flow switches, water pressure switches, manual fire alarm stations, high/low air pressure switches, and tamper switches). The module shall mount in an electrical box adjacent to or connected to the device it is monitoring and shall be capable of Style B supervised wiring to the initiating device. In order to maintain proper supervision, there shall be no T-taps allowed on style B lines. Addressable initiating device circuits modules shall monitor only one initiating device each. Contacts in suppression systems and other fire protection subsystems shall be connected to the fire alarm system to perform supervisory and alarm functions as specified in NFPA 72, as indicated on the drawings and as specified herein.

### 3.1.8 Addressable Control Module

Addressable and control modules shall be installed in the outlet box or adjacent to the device they are controlling. If a supplementary suppression releasing panel is provided, then the monitor modules shall be mounted in a common enclosure adjacent to the suppression releasing panel and both this enclosure and the suppression releasing panel shall be in the same room as the releasing devices. All interconnecting wires shall be supervised unless an open circuit or short circuit abnormal condition does not affect the required operation of the fire alarm system. If control modules are used as interfaces to other systems, such as HVAC or elevator

control, they shall be within the control panel or immediately adjacent to it. Control modules that control a group of notification appliances shall be adjacent to the first notification appliance in the notification appliance circuits. Control modules that connect to devices shall supervise the notification appliance circuits. Control modules that connect to auxiliary systems or interface with other systems (non-life safety systems) and where not required by NFPA 72, shall not require the secondary circuits to be supervised. Contacts in suppression systems and other fire protection subsystems shall be connected to the fire alarm system to perform required alarm functions as specified in NFPA 72, as indicated on the drawings and as specified herein.

### 3.2 OVERVOLTAGE AND SURGE PROTECTION

#### 3.2.1 Power Line Surge Protection

All equipment connected to alternating current circuits shall be protected from surges per IEEE C62.41 B3 combination waveform and NFPA 70. Fuses shall not be used for surge protection. The surge protector shall be rated for a maximum let thru voltage of 350 Volts ac (line-to-neutral) and 350 Volt ac (neutral-to-ground).

#### 3.2.2 Low Voltage DC Circuits Surge Protection

All IDC, NAC, and communication cables/conductors, except fiber optics, shall have surge protection installed at each point where it exits or enters a building. Equipment shall be protected from surges per IEEE C62.41 B3 combination waveform and NFPA 70. The surge protector shall be rated to protect the 24 Volt dc equipment. The maximum dc clamping voltages shall be 36 V (line-to-ground) and 72 Volt dc (line-to-line).

#### 3.2.3 Signal Line Circuit Surge Protection

All SLC cables/conductors, except fiber optics, shall have surge protection/isolation circuits installed at each point where it exits or enters a building. The circuit shall be protected from surges per IEEE C62.41 B3 combination waveform and NFPA 70. The surge protector/isolator shall be rated to protect the equipment.

### 3.3 GROUNDING

Grounding shall be provided by connecting to building ground system.

### 3.4 TESTING

The Contractor shall notify the Contracting Officer at least 10 days before the preliminary and acceptance tests are to be conducted. The tests shall be performed in accordance with the approved test procedures in the presence of the Contracting Officer. The control panel manufacturer's representative shall be present to supervise tests. The Contractor shall furnish instruments and personnel required for the tests.

#### 3.4.1 Preliminary Tests

Upon completion of the installation, the system shall be subjected to functional and operational performance tests including tests of each installed initiating and notification appliance, when required. Tests shall include the meggering of system conductors to determine that the system is free from grounded, shorted, or open circuits. The megger test

shall be conducted prior to the installation of fire alarm equipment. If deficiencies are found, corrections shall be made and the system shall be retested to assure that it is functional. After completing the preliminary testing the Contractor shall complete and submit the NFPA 72, Certificate of Completion.

#### 3.4.2 Acceptance Test

Acceptance testing shall not be performed until the Contractor has completed and submitted the Certificate of Completion. Testing shall be in accordance with NFPA 72. The recommended tests in NFPA 72 shall be considered mandatory and shall verify that previous deficiencies have been corrected. The Contractor shall complete and submit the NFPA 72, Inspection and Testing Form. The test shall include all requirements of NFPA 72 and the following:

- a. Test of each function of the control panel.
- b. Test of each circuit in both trouble and normal modes.
- c. Tests of each alarm initiating devices in both normal and trouble conditions.
- d. Tests of each control circuit and device.
- e. Tests of each alarm notification appliance.
- f. Tests of the battery charger and batteries.
- g. Complete operational tests under emergency power supply.
- h. Visual inspection of wiring connections.
- i. Opening the circuit at each alarm initiating device and notification appliance to test the wiring supervisory feature.
- j. Ground fault
- k. Short circuit faults
- l. Stray voltage
- m. Loop resistance

#### 3.5 TRAINING

Training course shall be provided for the operations and maintenance staff.

The course shall be conducted in the building where the system is installed or as designated by the Contracting Officer. The training period for systems operation shall consist of 1 training days (8 hours per day) and shall start after the system is functionally completed but prior to final acceptance tests. The training period for systems maintenance shall consist of 2 training days (8 hours per day) and shall start after the system is functionally completed but prior to final acceptance tests. The instructions shall cover items contained in the operating and maintenance instructions. In addition, training shall be provided on performance of expansions or modifications to the fire detection and alarm system. The training period for system expansions and modifications shall consist of at least 1 training days (8 hours per day) and shall start after the system is

functionally completed but prior to final acceptance tests.

-- End of Section --

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## SECTION 13930A

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01/04

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## SECTION 13930A

WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION  
01/04

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM A 135	(2001) Electric-Resistance-Welded Steel Pipe
ASTM A 183	(1998) Carbon Steel Track Bolts and Nuts
ASTM A 193/A 193M	(2001b) Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A 449	(2000) Quenched and Tempered Steel Bolts and Studs
ASTM A 47/A 47M	(1999) Ferritic Malleable Iron Castings
ASTM A 53/A 53M	(2002) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 536	(1984; R 1999e1) Ductile Iron Castings
ASTM A 563	(2000) Carbon and Alloy Steel Nuts
ASTM A 795	(2000) Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use
ASTM B 62	(2002) Composition Bronze or Ounce Metal Castings
ASTM B 75	(2002) Seamless Copper Tube
ASTM B 88	(2002) Seamless Copper Water Tube
ASTM D 2000	(2001) Rubber Products in Automotive Applications
ASTM F 436	(2002) Hardened Steel Washers

## AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1015	(1999) Double Check Backflow Prevention Assemblies and Double Check Fire
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## Protection Backflow Prevention Assemblies

## AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA B300	(1999) Hypochlorites
AWWA B301	(1999) Liquid Chlorine
AWWA C104	(1995) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C110	(1998) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm through 1219 mm), for Water
AWWA C111	(2000) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C151	(2002) Ductile-Iron Pipe, Centrifugally Cast, for Water
AWWA C203	(2002; A C203a-99) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied
AWWA C606	(1997) Grooved and Shouldered Joints
AWWA C651	(1999) Disinfecting Water Mains
AWWA C652	(2002) Disinfection of Water-Storage Facilities
AWWA EWW	(1998) Standard Methods for the Examination of Water and Wastewater

## ASME INTERNATIONAL (ASME)

ASME B16.1	(1998) Cast Iron Pipe Flanges and Flanged Fittings
ASME B16.11	(2002) Forged Fittings, Socket-Welding and Threaded
ASME B16.18	(2002) Cast Copper Alloy Solder Joint Pressure Fittings
ASME B16.21	(1992) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.22	(2002) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.26	(1988) Cast Copper Alloy Fittings for Flared Copper Tubes
ASME B16.3	(1998) Malleable Iron Threaded Fittings
ASME B16.4	(1998) Gray Iron Threaded Fittings

ASME B16.9	(2001) Factory-Made Wrought Steel Buttwelding Fittings
ASME B18.2.1	(1996) Square and Hex Bolts and Screws, Inch Series
ASME B18.2.2	(1987; R 1999) Square and Hex Nuts
FM GLOBAL (FM)	
FM P7825a	(2003) Approval Guide Fire Protection
FM P7825b	(2003) Approval Guide Electrical Equipment
MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)	
MSS SP-71	(1997) Gray Iron Swing Check Valves, Flanged and Threaded Ends
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)	
NFPA 101	(2003) Code for Safety to Life from Fire in Buildings and Structures
NFPA 13	(2002) Installation of Sprinkler Systems
NFPA 13D	(2002) Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes
NFPA 13R	(2002) Installation of Sprinkler Systems in Residential Occupancies Up to and Including Four Stories in Height
NFPA 1963	(2003) Fire Hose Connections
NFPA 24	(2002) Installation of Private Fire Service Mains and Their Appurtenances
NATIONAL INSTITUTE FOR CERTIFICATION IN ENGINEERING TECHNOLOGIES (NICET)	
NICET 1014-7	(1995) Program Detail Manual for Certification in the Field of Fire Protection Engineering Technology (Field Code 003) Subfield of Automatic Sprinkler System Layout
UNDERWRITERS LABORATORIES (UL)	
UL 668	(1995; Rev thru Dec 1998) Hose Valves for Fire Protection Service
UL Bld Mat Dir	(2003) Building Materials Directory
UL Fire Prot Dir	(2003) Fire Protection Equipment Directory

## 1.2 GENERAL REQUIREMENTS

Wet pipe sprinkler system shall be provided in all areas of the building. The sprinkler system shall provide fire sprinkler protection for the entire area. Except as modified herein, the system shall be designed and installed in accordance with NFPA 13. Rack sprinklers shall be in accordance with NFPA 13. Pipe sizes which are not indicated on drawings shall be determined by hydraulic calculation. The Contractor shall design any portions of the sprinkler system that are not indicated on the drawings including locating sprinklers, piping and equipment, and size piping and equipment when this information is not indicated on the drawings or is not specified herein. The design of the sprinkler system shall be based on hydraulic calculations, and the other provisions specified herein.

### 1.2.1 Hydraulic Design

The system shall be hydraulically designed to discharge a minimum density of 0.10 gpm per square foot for light hazard, 0.15 gpm for ordinary hazard Group I and 0.20 gpm for ordinary hazard Group II over the hydraulically most demanding 3,000 square feet of floor area. The minimum pipe size for branch lines in gridded systems shall be 1-1/4 inch. Hydraulic calculations shall be in accordance with the Area/Density Method of NFPA 13. Water velocity in the piping shall not exceed 20 ft/s.

#### 1.2.1.1 Hose Demand

An allowance for exterior hose streams of per occupancy classification shall be added to the sprinkler system demand at the fire hydrant closest to the point where the water service enters the building. An allowance for interior hose stations of per occupancy classification shall also be added to the sprinkler system demand.

#### 1.2.1.2 Basis for Calculations

Verify water supply before designing the sprinkler system. The design of the system shall be based upon a water supply with a static pressure of 88 psig, and a flow of 1350 gpm at a residual pressure of 81 psig. Water supply shall be presumed available at the test location. Hydraulic calculations shall be based upon the Hazen-Williams formula with a "C" value of 120 for steel piping, 150 for copper tubing, 140 for new cement-lined ductile-iron piping, and 100 for existing underground piping. Add domestic water demand of 90 gpm at base of the riser.

### 1.2.2 Sprinkler Coverage

Sprinklers shall be uniformly spaced on branch lines. In buildings protected by automatic sprinklers, sprinklers shall provide coverage throughout 100 percent of the building. This includes, but is not limited to, telephone rooms, electrical equipment rooms, boiler rooms, switchgear rooms, transformer rooms, and other electrical and mechanical spaces. Coverage per sprinkler shall be in accordance with NFPA 13, but shall not exceed 100 square feet for extra hazard occupancies, 130 square feet for ordinary hazard occupancies, and 225 square feet for light hazard occupancies. Exceptions are as follows:

- 1) Facilities that are designed in accordance with NFPA 13R and NFPA 13D.
- 2) Sprinklers may be omitted from small rooms which are exempted for specific occupancies in accordance with NFPA 101.

### 1.3 COORDINATION OF TRADES

Piping offsets, fittings, and any other accessories required shall be furnished as required to provide a complete installation and to eliminate interference with other construction. Sprinkler shall be installed over and under ducts, piping and platforms when such equipment can negatively effect or disrupt the sprinkler discharge pattern and coverage.

### 1.4 DELIVERY AND STORAGE

All equipment delivered and placed in storage shall be housed in a manner to preclude any damage from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Additionally, all pipes shall either be capped or plugged until installed.

### 1.5 FIELD MEASUREMENTS

The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

### 1.6 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

##### Shop Drawings; G-AE

Six copies of the Sprinkler System Shop Drawings, no later than 21 days prior to the start of sprinkler system installation.

##### As-Built Drawings

As-built shop drawings, at least 14 days after completion of the Final Tests. The Sprinkler System Drawings shall be updated to reflect as-built conditions after all related work is completed and shall be on reproducible full-size mylar film.

#### SD-03 Product Data

##### Fire Protection Related Submittals

A list of the Fire Protection Related Submittals, no later than 7 days after the approval of the Fire Protection Specialist.

##### Sway Bracing; G-AE

For systems that are required to be protected against damage from earthquakes, load calculations shall be provided for sizing of sway bracing.

##### Materials and Equipment; G-AE

Manufacturer's catalog data included with the Sprinkler System Drawings for all items specified herein. The data shall be highlighted to show model, size, options, etc., that are intended for consideration. Data shall be adequate to demonstrate compliance with all contract requirements. In addition, a complete equipment list that includes equipment description, model number and quantity shall be provided.

#### Hydraulic Calculations; G-AE

Hydraulic calculations, including a drawing showing hydraulic reference points and pipe segments.

#### Spare Parts

Spare parts data shall be included for each different item of material and equipment specified.

#### Preliminary Tests; G-AO

Proposed procedures for Preliminary Tests, no later than 14 days prior to the proposed start of the tests. Proposed date and time to begin the preliminary tests.

#### Final Acceptance Test; G-AO

Proposed procedures for Final Acceptance Test, no later than 14 days prior to the proposed start of the tests. Proposed date and time to begin Final Acceptance Test, submitted with the Final Acceptance Test Procedures. Notification shall be provided at least 14 days prior to the proposed start of the test. Notification shall include a copy of the Contractor's Material & Test Certificates.

#### On-site Training; G-AO

Proposed On-site Training schedule, at least 14 days prior to the start of related training.

#### Fire Protection Specialist; G-AO

The name and documentation of certification of the proposed Fire Protection Specialists, no later than 14 days after the Notice to Proceed and prior to the submittal of the sprinkler system drawings and hydraulic calculations.

#### Sprinkler System Installer; G-AO

The name and documentation of certification of the proposed Sprinkler System Installer, concurrent with submittal of the Fire Protection Specialist Qualifications.

### SD-06 Test Reports

#### Preliminary Test Report; G-AE

Five copies of the completed Preliminary Test Report, no later than 7 days after the completion of the Preliminary Tests. The

Preliminary Tests Report shall include both the Contractor's Material and Test Certificate for Underground Piping and the Contractor's Material and Test Certificate for Aboveground Piping. All items in the Preliminary Tests Report shall be signed by the Fire Protection Specialist.

Final Acceptance Test Report; G-AE

Five copies of the completed Final Acceptance Tests Reports, no later than 7 days after the completion of the Final Acceptance Tests. All items in the Final Acceptance Report shall be signed by the Fire Protection Specialist.

#### SD-07 Certificates

Inspection by Fire Protection Specialist; G-AO

Concurrent with the Final Acceptance Test Report, certification by the Fire Protection Specialist that the sprinkler system is installed in accordance with the contract requirements, including signed approval of the Preliminary and Final Acceptance Test Reports.

#### SD-10 Operation and Maintenance Data

Operating and Maintenance Instructions

Six manuals listing step-by-step procedures required for system startup, operation, shutdown, and routine maintenance, at least 14 days prior to field training. The manuals shall include the manufacturer's name, model number, parts list, list of parts and tools that should be kept in stock by the owner for routine maintenance including the name of a local supplier, simplified wiring and controls diagrams, troubleshooting guide, and recommended service organization (including address and telephone number) for each item of equipment. Each service organization submitted shall be capable of providing 4 hour on-site response to a service call on an emergency basis.

### 1.7 HYDRAULIC CALCULATIONS

Hydraulic calculations shall be as outlined in NFPA 13 except that calculations shall be performed by computer using software intended specifically for fire protection system design using the design data shown on the drawings. Software that uses k-factors for typical branch lines is not acceptable. Calculations shall be based on the water supply data shown on the drawings. Calculations shall substantiate that the design area used in the calculations is the most demanding hydraulically. Water supply curves and system requirements shall be plotted on semi-logarithmic graph paper so as to present a summary of the complete hydraulic calculation. A summary sheet listing sprinklers in the design area and their respective hydraulic reference points, elevations, actual discharge pressures and actual flows shall be provided. Elevations of hydraulic reference points (nodes) shall be indicated. Documentation shall identify each pipe individually and the nodes connected thereto. The diameter, length, flow, velocity, friction loss, number and type fittings, total friction loss in the pipe, equivalent pipe length and Hazen-Williams coefficient shall be indicated for each pipe. For gridded systems, calculations shall show peaking of demand area friction loss to verify that the hydraulically most

demanding area is being used. Also for gridded systems, a flow diagram indicating the quantity and direction of flows shall be included. A drawing showing hydraulic reference points (nodes) and pipe designations used in the calculations shall be included and shall be independent of shop drawings.

#### 1.8 FIRE PROTECTION SPECIALIST

Work specified in this section shall be performed under the supervision of and certified by the Fire Protection Specialist. The Fire Protection Specialist shall be an individual who is a registered professional engineer and a Full Member of the Society of Fire Protection Engineers or who is certified as a Level IV Technician by National Institute for Certification in Engineering Technologies (NICET) in the Automatic Sprinkler System Layout subfield of Fire Protection Engineering Technology in accordance with NICET 1014-7. The Fire Protection Specialist shall be regularly engaged in the design and installation of the type and complexity of system specified in the Contract documents, and shall have served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months.

#### 1.9 SPRINKLER SYSTEM INSTALLER

Work specified in this section shall be performed by the Sprinkler System Installer. The Sprinkler System Installer shall be regularly engaged in the installation of the type and complexity of system specified in the Contract documents, and shall have served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months.

#### 1.10 REGULATORY REQUIREMENTS

Compliance with referenced NFPA standards is mandatory. This includes advisory provisions listed in the appendices of such standards, as though the word "shall" had been substituted for the word "should" wherever it appears. In the event of a conflict between specific provisions of this specification and applicable NFPA standards, this specification shall govern. Reference to "authority having jurisdiction" shall be interpreted to mean the Contracting Officer.

#### 1.11 SPARE PARTS

The Contractor shall submit spare parts data for each different item of material and equipment specified. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of parts recommended by the manufacturer to be replaced after 1 year and 3 years of service. A list of special tools and test equipment required for maintenance and testing of the products supplied by the Contractor shall be included.

#### 1.12 SHOP DRAWINGS

The Sprinkler System Shop Drawings shall conform to the requirements established for working plans as prescribed in NFPA 13. Drawings shall include plan and elevation views demonstrating that the equipment will fit the allotted spaces with clearance for installation and maintenance. Each set of drawings shall include the following:

- a. Descriptive index of drawings in the submittal with

drawings listed in sequence by drawing number. A legend identifying device symbols, nomenclature, and conventions used.

b. Floor plans drawn to a scale not less than  $1/8" = 1'-0"$  which clearly show locations of sprinklers, risers, pipe hangers, seismic separation assemblies, sway bracing, inspector's test connections, drains, and other applicable details necessary to clearly describe the proposed arrangement. Each type of fitting used and the locations of bushings, reducing couplings, and welded joints shall be indicated.

c. Actual center-to-center dimensions between sprinklers on branch lines and between branch lines; from end sprinklers to adjacent walls; from walls to branch lines; from sprinkler feed mains, cross-mains and branch lines to finished floor and roof or ceiling. A detail shall show the dimension from the sprinkler and sprinkler deflector to the ceiling in finished areas.

d. Longitudinal and transverse building sections showing typical branch line and cross-main pipe routing as well as elevation of each typical sprinkler above finished floor.

e. Details of each type of riser assembly; pipe hanger; sway bracing for earthquake protection, and restraint of underground water main at point-of-entry into the building, and electrical devices and interconnecting wiring.

## PART 2 PRODUCTS

### 2.1 STANDARD PRODUCTS

Materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

### 2.2 NAMEPLATES

All equipment shall have a nameplate that identifies the manufacturer's name, address, type or style, model or serial number, and catalog number.

### 2.3 REQUIREMENTS FOR FIRE PROTECTION SERVICE

Materials and Equipment shall have been tested by Underwriters Laboratories, Inc. and listed in UL Fire Prot Dir or approved by Factory Mutual and listed in FM P7825a and FM P7825b. Where the terms "listed" or "approved" appear in this specification, such shall mean listed in UL Fire Prot Dir or FM P7825a and FM P7825b

### 2.4 UNDERGROUND PIPING COMPONENTS

#### 2.4.1 Pipe

Piping from a point 6 inches above the floor to a point 5 feet outside the building wall shall be ductile iron with a rated working pressure of 150 psi conforming to AWWA C151, with cement mortar lining conforming to AWWA C104. Piping more than 5 feet outside the building walls shall comply with Section 02510A WATER DISTRIBUTION SYSTEM.



#### 2.4.2 Fittings and Gaskets

Fittings shall be ductile iron conforming to AWWA C110. Gaskets shall be suitable in design and size for the pipe with which such gaskets are to be used. Gaskets for ductile iron pipe joints shall conform to AWWA C111.

#### 2.4.3 Gate Valve and Indicator Posts

Gate valves for underground installation shall be of the inside screw type with counter-clockwise rotation to open. Where indicating type valves are shown or required, indicating valves shall be gate valves with an approved indicator post of a length to permit the top of the post to be located 3 feet above finished grade. Gate valves and indicator posts shall be listed in UL Fire Prot Dir or FM P7825a and FM P7825b.

### 2.5 ABOVEGROUND PIPING COMPONENTS

Aboveground piping shall be steel or copper.

#### 2.5.1 Steel Piping Components

##### 2.5.1.1 Steel Pipe

Except as modified herein, steel pipe shall be black or galvanized as permitted by NFPA 13 and shall conform to applicable provisions of ASTM A 795, ASTM A 53/A 53M, or ASTM A 135. Pipe in which threads or grooves are cut shall be Schedule 40 or shall be listed by Underwriters' Laboratories to have a corrosion resistance ratio (CRR) of 1.0 or greater after threads or grooves are cut. Pipe shall be marked with the name of the manufacturer, kind of pipe, and ASTM designation.

##### 2.5.1.2 Fittings for Non-Grooved Steel Pipe

Fittings shall be cast iron conforming to ASME B16.4, steel conforming to ASME B16.9 or ASME B16.11, or malleable iron conforming to ASME B16.3. Steel press fittings shall be approved for fire protection systems. Galvanized fittings shall be used for piping systems or portions of piping systems utilizing galvanized piping. Fittings into which sprinklers, drop nipples or riser nipples (sprigs) are screwed shall be threaded type. Plain-end fittings with mechanical couplings, fittings that use steel gripping devices to bite into the pipe and segmented welded fittings shall not be used.

##### 2.5.1.3 Grooved Mechanical Joints and Fittings

Joints and fittings shall be designed for not less than 175 psi service and shall be the product of the same manufacturer; segmented welded fittings shall not be used. Fitting and coupling houses shall be malleable iron conforming to ASTM A 47/A 47M, Grade 32510; ductile iron conforming to ASTM A 536, Grade 65-45-12. Gasket shall be the flush type that fills the entire cavity between the fitting and the pipe. Nuts and bolts shall be heat-treated steel conforming to ASTM A 183 and shall be cadmium plated or zinc electroplated.

##### 2.5.1.4 Flanges

Flanges shall conform to NFPA 13 and ASME B16.1. Gaskets shall be non-asbestos compressed material in accordance with ASME B16.21, 1/16 inch thick, and full face or self-centering flat ring type.

#### 2.5.1.5 Bolts, Nut, and Washers

Bolts shall be squarehead conforming to ASME B18.2.1, ASTM A 449, Type 1 or 2 and shall extend no less than three full threads beyond the nut with bolts tightened to the required torque. Nuts shall be hexagon type conforming to ASME B18.2.2, ASTM A 193/A 193M, Grade 5, ASTM A 563, Grade C3 or DH3. Washers shall meet the requirements of ASTM F 436. Flat circular washers shall be provided under all bolt heads and nuts.

#### 2.5.2 Copper Tube Components

##### 2.5.2.1 Copper Tube

Copper tube shall conform to ASTM B 88, Types L and M.

##### 2.5.2.2 Copper Fittings and Joints

Cast copper alloy solder-joint pressure fittings shall conform to ASME B16.18 and wrought copper and bronze solder-joint pressure fittings shall conform to ASME B16.22 and ASTM B 75. Cast copper alloy fittings for flared copper tube shall conform to ASME B16.26 and ASTM B 62. Brass or bronze adapters for brazed tubing may be used for connecting tubing to flanges and to threaded ends of valves and equipment. Extracted brazed tee joints produced with an acceptable tool and installed as recommended by the manufacturer may be used. Grooved mechanical joints and fittings shall be designed for not less than 125 psig service and shall be the product of the same manufacturer. Grooved fitting and mechanical coupling housing shall be ductile iron conforming to ASTM A 536. Gaskets for use in grooved joints shall be molded synthetic polymer of pressure responsive design and shall conform to ASTM D 2000 for circulating medium up to 230 degrees F. Grooved joints shall conform to AWWA C606. Coupling nuts and bolts for use in grooved joints shall be steel and shall conform to ASTM A 183.

#### 2.5.3 Pipe Hangers

Hangers shall be listed in UL Fire Prot Dir or FM P7825a and FM P7825b and of the type suitable for the application, construction, and pipe type and sized to be supported.

#### 2.5.4 Valves

##### 2.5.4.1 Control Valve and Gate Valve

Manually operated sprinkler control valve and gate valve shall be outside stem and yoke (OS&Y) type and shall be listed in UL Bld Mat Dir or FM P7825a and FM P7825b.

##### 2.5.4.2 Check Valve

Check valve 2 inches and larger shall be listed in UL Bld Mat Dir or FM P7825a and FM P7825b. Check valves 4 inches and larger shall be of the swing type with flanged cast iron body and flanged inspection plate, shall have a clear waterway and shall meet the requirements of MSS SP-71, for Type 3 or 4.

##### 2.5.4.3 Hose Valve

Valve shall comply with UL 668 and shall have a minimum rating of 300 psi.

Valve shall be non-rising stem, all bronze, 90 degree angle type, with 2-1/2 inch American National Standard Fire Hose Screw Thread (NH) male outlet in accordance with NFPA 1963. Hose valve shall be provided with 2-1/2 to 1-1/2 inch reducer. Hose valves shall be equipped with lugged cap with drip drain, cap gasket and chain. Valve finish shall be polished brass.

## 2.6 ALARM CHECK VALVE ASSEMBLY

Assembly shall include an alarm check valve, standard trim piping, pressure gauges, bypass, retarding chamber, testing valves, main drain, and other components as required for a fully operational system.

## 2.7 WATERFLOW ALARM

Electrically operated, exterior-mounted, waterflow alarm bell shall be provided and installed in accordance with NFPA 13. Waterflow alarm bell shall be rated 24 VDC and shall be connected to the Fire Alarm Control Panel (FACP) in accordance with Section 13851A FIRE DETECTION AND ALARM SYSTEM, ADDRESSABLE. Mechanically operated, exterior-mounted, water motor alarm assembly shall be provided and installed in accordance with NFPA 13. Water motor alarm assembly shall include a body housing, impeller or pelton wheel, drive shaft, striker assembly, gong, wall plate and related components necessary for complete operation. Minimum 3/4 inch galvanized piping shall be provided between the housing and the alarm check valve. Drain piping from the body housing shall be minimum 1 inch galvanized and shall be arranged to drain to the outside of the building. Piping shall be galvanized both on the inside and outside surfaces.

## 2.8 ALARM INITIATING AND SUPERVISORY DEVICES

### 2.8.1 Sprinkler Waterflow Indicator Switch, Vane Type

Switch shall be vane type with a pipe saddle and cast aluminum housing. The electro-mechanical device shall include a flexible, low-density polyethylene paddle conforming to the inside diameter of the fire protection pipe. The device shall sense water movements and be capable of detecting a sustained flow of 10 gpm or greater. The device shall contain a retard device adjustable from 0 to 90 seconds to reduce the possibility of false alarms caused by transient flow surges. The switch shall be tamper resistant and contain two SPDT (Form C) contacts arranged to transfer upon removal of the housing cover, and shall be equipped with a silicone rubber gasket to assure positive water seal and a dustproof cover and gasket to seal the mechanism from dirt and moisture.

### 2.8.2 Sprinkler Pressure (Waterflow) Alarm Switch

Pressure switch shall include a metal housing with a neoprene diaphragm, SPDT snap action switches and a 1/2 inch NPT male pipe thread. The switch shall have a maximum service pressure rating of 175 psi. There shall be two SPDT (Form C) contacts factory adjusted to operate at 4 to 8 psi. The switch shall be capable of being mounted in any position in the alarm line trim piping of the alarm check valve.

### 2.8.3 Valve Supervisory (Tamper) Switch

Switch shall be suitable for mounting to the type of control valve to be supervised open. The switch shall be tamper resistant and contain one set of SPDT (Form C) contacts arranged to transfer upon removal of the housing

cover or closure of the valve of more than two rotations of the valve stem.

## 2.9 FIRE DEPARTMENT CONNECTION

Fire department connection shall be projecting type with cast brass body, matching wall escutcheon lettered "Auto Spkr" with a polished brass finish.

The connection shall have two inlets with individual self-closing clappers, caps with drip drains and chains. Female inlets shall have 2-1/2 inch diameter American National Fire Hose Connection Screw Threads (NH) per NFPA 1963.

## 2.10 SPRINKLERS

Sprinklers with internal O-rings shall not be used. Sprinklers shall be used in accordance with their listed coverage limitations. Temperature classification shall be ordinary. Sprinklers in high heat areas including attic spaces or in close proximity to unit heaters shall have temperature classification in accordance with NFPA 13. Extended coverage sprinklers shall not be used.

### 2.10.1 Concealed Sprinkler

Concealed sprinkler shall have factory finish matching as closely as possible with ceiling and shall have a nominal 1/2 inch or 17/32 inch orifice.

### 2.10.2 Recessed Sprinkler

Recessed sprinkler shall be white polyester and shall have a nominal 1/2 inch or 17/32 inch orifice.

### 2.10.3 Flush Sprinkler

Flush sprinkler shall be white polyester and shall have a nominal 1/2 inch or 17/32 inch orifice.

### 2.10.4 Pendent Sprinkler

Pendent sprinkler shall be of the fusible strut or glass bulb type, with nominal 1/2 inch or 17/32 inch orifice. Pendent sprinklers shall have a polished chrome finish.

### 2.10.5 Upright Sprinkler

Upright sprinkler shall be brass and shall have a nominal 1/2 inch or 17/32 inch orifice.

### 2.10.6 Sidewall Sprinkler

Sidewall sprinkler shall have a nominal 1/2 inch orifice. Sidewall sprinkler shall have a white polyester finish. Sidewall sprinkler shall be the quick-response type.

### 2.10.7 Intermediate Level Rack Sprinkler

Intermediate level rack sprinkler shall be of the upright or pendent type with nominal 1/2 inch orifice and minimum "K" factor of 5.5. The sprinkler shall be equipped with a deflector plate to shield the fusible element from water discharged above it.

#### 2.10.8 Corrosion Resistant Sprinkler

Corrosion resistant sprinkler shall be the upright or pendent type installed in locations as indicated. Corrosion resistant coatings shall be factory-applied by the sprinkler manufacturer.

#### 2.10.9 Dry Sprinkler Assembly

Dry sprinkler assembly shall be of the pendent, or sidewall type as indicated. Assembly shall include an integral escutcheon. Maximum length shall not exceed maximum indicated in UL Fire Prot Dir. Sprinklers shall have a white enamel finish.

#### 2.11 DISINFECTING MATERIALS

##### 2.11.1 Liquid Chlorine

Liquid chlorine shall conform to AWWA B301.

##### 2.11.2 Hypochlorites

Calcium hypochlorite and sodium hypochlorite shall conform to AWWA B300.

#### 2.12 ACCESSORIES

##### 2.12.1 Sprinkler Cabinet

Spare sprinklers shall be provided in accordance with NFPA 13 and shall be packed in a suitable metal or plastic cabinet. Spare sprinklers shall be representative of, and in proportion to, the number of each type and temperature rating of the sprinklers installed. At least one wrench of each type required shall be provided.

##### 2.12.2 Pendent Sprinkler Escutcheon

Escutcheon shall be one-piece metallic type with a depth of less than 3/4 inch and suitable for installation on pendent sprinklers. The escutcheon shall have a factory finish that matches the pendent sprinkler heads.

##### 2.12.3 Pipe Escutcheon

Escutcheon shall be polished chromium-plated zinc alloy, or polished chromium-plated copper alloy. Escutcheons shall be either one-piece or split-pattern, held in place by internal spring tension or set screw.

##### 2.12.4 Sprinkler Guard

Guard shall be a steel wire cage designed to encase the sprinkler and protect it from mechanical damage. Guards shall be provided on sprinklers located inside the rack or at elevation of 7 feet or less from floor..

##### 2.12.5 Identification Sign

Valve identification sign shall be minimum 6 inches wide x 2 inches high with enamel baked finish on minimum 18 gauge steel or 0.024 inch aluminum with red letters on a white background or white letters on red background. Wording of sign shall include, but not be limited to "main drain," "auxiliary drain," "inspector's test," "alarm test," "alarm line," and

similar wording as required to identify operational components.

#### 2.13 FIRE HOSE REEL ASSEMBLY

Assembly shall include nozzle, fire hose, reel, 1-1/2 inch valve, and bracket suitable for wall mounting. The assembly shall be semi-automatic type complete with Underwriters clip which permits controlled one-man operation whereby control valve can be opened, hose unreeled and clip released by pulling on hose. Valve shall be non-rising stem, all bronze, angle type with 1-1/2 inch American National Standard Fire Hose Screw Thread (NH) male outlet in accordance with NFPA 1963. Reel shall be of steel construction with red enamel finish and shall be equipped with (100) feet of 1-1/2 inch rubber lined fire hose. Nozzle shall be of the industrial combination fog-straight stream type with shutoff. Components of the assembly shall be listed in UL Fire Prot Dir.

#### 2.14 DOUBLE-CHECK VALVE BACKFLOW PREVENTION ASSEMBLY

Double-check backflow prevention assembly shall comply with ASSE 1015. The assembly shall have a bronze, cast-iron or stainless steel body with flanged ends. The assembly shall include pressure gauge test ports and OS&Y shutoff valves on the inlet and outlet, 2-positive-seating check valve for continuous pressure application, and four test cocks. Assemblies shall be rated for working pressure of 175 psi. The maximum pressure loss shall be 6 psi at a flow rate equal to the sprinkler water demand, at the location of the assembly. A test port for a pressure gauge shall be provided both upstream and downstream of the double check backflow prevention assembly valves.

### PART 3 EXECUTION

#### 3.1 FIRE PROTECTION RELATED SUBMITTALS

The Fire Protection Specialist shall prepare a list of the submittals from the Contract Submittal Register that relate to the successful installation of the sprinkler systems(s). The submittals identified on this list shall be accompanied by a letter of approval signed and dated by the Fire Protection Specialist when submitted to the Government.

#### 3.2 INSTALLATION REQUIREMENTS

The installation shall be in accordance with the applicable provisions of NFPA 13, NFPA 24 and publications referenced therein. Installation of in-rack sprinklers shall comply with applicable provisions of NFPA 13.

#### 3.3 INSPECTION BY FIRE PROTECTION SPECIALIST

The Fire Protection Specialist shall inspect the sprinkler system periodically during the installation to assure that the sprinkler system is being provided and installed in accordance with the contract requirements. The Fire Protection Specialist shall witness the preliminary and final tests, and shall sign the test results. The Fire Protection Specialist, after completion of the system inspections and a successful final test, shall certify in writing that the system has been installed in accordance with the contract requirements. Any discrepancy shall be brought to the attention of the Contracting Officer in writing, no later than three working days after the discrepancy is discovered.

### 3.4 ABOVEGROUND PIPING INSTALLATION

#### 3.4.1 Protection of Piping Against Earthquake Damage

The system piping shall be protected against damage from earthquakes. Seismic protection shall include flexible and rigid couplings, sway bracing, seismic separation assemblies where piping crosses building seismic separation joints, and other features as required by NFPA 13 for protection of piping against damage from earthquakes.

#### 3.4.2 Piping in Exposed Areas

Exposed piping shall be installed so as not to diminish exit access widths, corridors or equipment access. Exposed horizontal piping, including drain piping, shall be installed to provide maximum headroom.

#### 3.4.3 Piping in Finished Areas

In areas with suspended or dropped ceilings and in areas with concealed spaces above the ceiling, piping shall be concealed above ceilings. Piping shall be inspected, tested and approved before being concealed. Risers and similar vertical runs of piping in finished areas shall be concealed.

#### 3.4.4 Pendent Sprinklers

Drop nipples to pendent sprinklers shall consist of minimum 1 inch pipe with a reducing coupling into which the sprinkler shall be threaded. Hangers shall be provided on arm-overs to drop nipples supplying pendent sprinklers when the arm-over exceeds 12 inches. Where sprinklers are installed below suspended or dropped ceilings, drop nipples shall be cut such that sprinkler ceiling plates or escutcheons are of a uniform depth throughout the finished space. The outlet of the reducing coupling shall not extend more than 1 inch below the underside of the ceiling. On pendent sprinklers installed below suspended or dropped ceilings, the distance from the sprinkler deflector to the underside of the ceiling shall not exceed 4 inches. Recessed pendent sprinklers shall be installed such that the distance from the sprinkler deflector to the underside of the ceiling shall not exceed the manufacturer's listed range and shall be of uniform depth throughout the finished area.

##### 3.4.4.1 Pendent Sprinkler Locations

Pendent sprinklers in suspended ceilings shall be a minimum of 6 inches from ceiling grid.

#### 3.4.5 Upright Sprinklers

Riser nipples or "sprigs" to upright sprinklers shall contain no fittings between the branch line tee and the reducing coupling at the sprinkler. Riser nipples exceeding 30 inches in length shall be individually supported.

#### 3.4.6 Pipe Joints

Pipe joints shall conform to NFPA 13, except as modified herein. Not more than four threads shall show after joint is made up. Welded joints will be permitted, only if welding operations are performed as required by NFPA 13 at the Contractor's fabrication shop, not at the project construction site.

Flanged joints shall be provided where indicated or required by NFPA 13. Grooved pipe and fittings shall be prepared in accordance with the

manufacturer's latest published specification according to pipe material, wall thickness and size. Grooved couplings, fittings and grooving tools shall be products of the same manufacturer. For copper tubing, pipe and groove dimensions shall comply with the tolerances specified by the coupling manufacturer. The diameter of grooves made in the field shall be measured using a "go/no-go" gauge, vernier or dial caliper, narrow-land micrometer, or other method specifically approved by the coupling manufacturer for the intended application. Groove width and dimension of groove from end of pipe shall be measured and recorded for each change in grooving tool setup to verify compliance with coupling manufacturer's tolerances. Grooved joints shall not be used in concealed locations, such as behind solid walls or ceilings, unless an access panel is shown on the drawings for servicing or adjusting the joint.

#### 3.4.7 Reducers

Reductions in pipe sizes shall be made with one-piece tapered reducing fittings. The use of grooved-end or rubber-gasketed reducing couplings will not be permitted. When standard fittings of the required size are not manufactured, single bushings of the face type will be permitted. Where used, face bushings shall be installed with the outer face flush with the face of the fitting opening being reduced. Bushings shall not be used in elbow fittings, in more than one outlet of a tee, in more than two outlets of a cross, or where the reduction in size is less than 1/2 inch.

#### 3.4.8 Pipe Penetrations

Cutting structural members for passage of pipes or for pipe-hanger fastenings will not be permitted. Pipes that must penetrate concrete or masonry walls or concrete floors shall be core-drilled and provided with pipe sleeves. Each sleeve shall be Schedule 40 galvanized steel, ductile iron or cast iron pipe and shall extend through its respective wall or floor and be cut flush with each wall surface. Sleeves shall provide required clearance between the pipe and the sleeve per NFPA 13. The space between the sleeve and the pipe shall be firmly packed with mineral wool insulation. Where pipes penetrate fire walls, fire partitions, or floors, pipes shall be fire stopped in accordance with Section 07840 FIRESTOPPING. In penetrations that are not fire-rated or not a floor penetration, the space between the sleeve and the pipe shall be sealed at both ends with plastic waterproof cement that will dry to a firm but pliable mass or with a mechanically adjustable segmented elastomer seal.

#### 3.4.9 Escutcheons

Escutcheons shall be provided for pipe penetration of ceilings and walls. Escutcheons shall be securely fastened to the pipe at surfaces through which piping passes.

#### 3.4.10 Inspector's Test Connection

Unless otherwise indicated, test connection shall consist of 1 inch pipe connected to the remote branch line; a test valve located approximately 7 feet above the floor; a smooth bore brass outlet equivalent to the smallest orifice sprinkler used in the system; and a painted metal identification sign affixed to the valve with the words "Inspector's Test." The discharge orifice shall be located outside the building wall directed so as not to cause damage to adjacent construction or landscaping during full flow discharge.



#### 3.4.11 Drains

Main drain piping shall be provided to discharge at a safe point outside the building. Auxiliary drains shall be provided as required by NFPA 13.

#### 3.4.12 Installation of Fire Department Connection

Connection shall be mounted on the exterior wall approximately 3 feet above finished grade on the sprinkler side of backflow preventer. The piping between the connection and the check valve shall be provided with an automatic drip in accordance with NFPA 13 and arranged to drain to the outside.

#### 3.4.13 Identification Signs

Signs shall be affixed to each control valve, inspector test valve, main drain, auxiliary drain, test valve, and similar valves as appropriate or as required by NFPA 13. Hydraulic design data nameplates shall be permanently affixed to each sprinkler riser as specified in NFPA 13.

### 3.5 UNDERGROUND PIPING INSTALLATION

The fire protection water main shall be laid, and joints anchored, in accordance with NFPA 24. Minimum depth of cover shall be per NFPA 24. The supply line shall terminate inside the building with a flanged piece, the bottom of which shall be set not less than 6 inches above the finished floor. A blind flange shall be installed temporarily on top of the flanged piece to prevent the entrance of foreign matter into the supply line. A concrete thrust block shall be provided at the elbow where the pipe turns up toward the floor. In addition, joints shall be anchored in accordance with NFPA 24 using pipe clamps and steel rods from the elbow to the flange above the floor and from the elbow to a pipe clamp in the horizontal run of pipe. Buried steel components shall be provided with a corrosion protective coating in accordance with AWWA C203. Piping more than 5 feet outside the building walls shall meet the requirements of Section 02510A WATER DISTRIBUTION SYSTEM.

### 3.6 EARTHWORK

Earthwork shall be performed in accordance with applicable provisions of Section 02300 EARTHWORK.

### 3.7 ELECTRICAL WORK

Except as modified herein, electric equipment and wiring shall be in accordance with Section 16415A ELECTRICAL WORK, INTERIOR. Alarm signal wiring connected to the building fire alarm control system shall be in accordance with Section 13851A FIRE DETECTION AND ALARM SYSTEM, ADDRESSABLE. All wiring for supervisory and alarm circuits shall be #14 or #16 AWG solid copper installed in metallic tubing or conduit. Wiring color code shall remain uniform throughout the system.

### 3.8 DISINFECTION

After all system components are installed and hydrostatic test(s) are successfully completed, each portion of the sprinkler system to be disinfected shall be thoroughly flushed with potable water until all entrained dirt and other foreign materials have been removed before introducing chlorinating material. Flushing shall be conducted by removing

the flushing fitting of the cross mains and of the grid branch lines, and then back-flushing through the sprinkler main drains. The chlorinating material shall be hypochlorites or liquid chlorine. Water chlorination procedure shall be in accordance with AWWA C651 and AWWA C652. The chlorinating material shall be fed into the sprinkler piping at a constant rate of 50 parts per million (ppm). A properly adjusted hypochlorite solution injected into the system with a hypochlorinator, or liquid chlorine injected into the system through a solution-fed chlorinator and booster pump shall be used. Chlorination application shall continue until the entire system is filled. The water shall remain in the system for a minimum of 24 hours. Each valve in the system shall be opened and closed several times to ensure its proper disinfection. Following the 24-hour period, no less than 25 ppm chlorine residual shall remain in the system. The system shall then be flushed with clean water until the residual chlorine is reduced to less than one part per million. Samples of water in disinfected containers for bacterial examination will be taken from several system locations which are approved by the Contracting Officer. Samples shall be tested for total coliform organisms (coliform bacteria, fecal coliform, streptococcal, and other bacteria) in accordance with AWWA EWW. The testing method shall be either the multiple-tube fermentation technique or the membrane-filter technique. The disinfection shall be repeated until tests indicate the absence of coliform organisms (zero mean coliform density per 100 milliliters) in the samples for at least 2 full days. The system will not be accepted until satisfactory bacteriological results have been obtained. After successful completion, verify installation of all sprinklers and plugs and pressure test the system.

### 3.9 PIPE COLOR CODE MARKING

Color code marking of piping shall be as specified in Section 09900 PAINTS AND COATINGS.

### 3.10 PRELIMINARY TESTS

The system, including the underground water mains, and the aboveground piping and system components, shall be tested to assure that equipment and components function as intended. The underground and aboveground interior piping systems and attached appurtenances subjected to system working pressure shall be tested in accordance with NFPA 13 and NFPA 24. Upon completion of specified tests, the Contractor shall complete certificates as specified in paragraph SUBMITTALS.

#### 3.10.1 Underground Piping

##### 3.10.1.1 Flushing

Underground piping shall be flushed in accordance with NFPA 24. This includes the requirement to flush the lead-in connection to the fire protection system at a flow rate not less than the calculated maximum water demand rate of the system.

##### 3.10.1.2 Hydrostatic Testing

New underground piping shall be hydrostatically tested in accordance with NFPA 24. The allowable leakage shall be measured at the specified test pressure by pumping from a calibrated container. The amount of leakage at the joints shall not exceed 2 quarts per hour per 100 gaskets or joints, regardless of pipe diameter.

### 3.10.2 Aboveground Piping

#### 3.10.2.1 Hydrostatic Testing

Aboveground piping shall be hydrostatically tested in accordance with NFPA 13 at not less than 200 psi or 50 psi in excess of maximum system operating pressure and shall maintain that pressure without loss for 2 hours. There shall be no drop in gauge pressure or visible leakage when the system is subjected to the hydrostatic test. The test pressure shall be read from a gauge located at the low elevation point of the system or portion being tested.

#### 3.10.2.2 Backflow Prevention Assembly Forward Flow Test

Each backflow prevention assembly shall be tested at system flow demand, including all applicable hose streams, as specified in NFPA 13. The Contractor shall provide all equipment and instruments necessary to conduct a complete forward flow test, including 2.5 inch diameter hoses, playpipe nozzles, calibrated pressure gauges, and pitot tube gauge. The Contractor shall provide all necessary supports to safely secure hoses and nozzles during the test. At the system demand flow, the pressure readings and pressure drop (friction) across the assembly shall be recorded. A metal placard shall be provided on the backflow prevention assembly that lists the pressure readings both upstream and downstream of the assembly, total pressure drop, and the system test flow rate. The pressure drop shall be compared to the manufacturer's data.

#### 3.10.3 Testing of Alarm Devices

Each alarm switch shall be tested by flowing water through the inspector's test connection. Each water-operated alarm devices shall be tested to verify proper operation.

#### 3.10.4 Main Drain Flow Test

Following flushing of the underground piping, a main drain test shall be made to verify the adequacy of the water supply. Static and residual pressures shall be recorded on the certificate specified in paragraph SUBMITTALS. In addition, a main drain test shall be conducted each time after a main control valve is shut and opened.

### 3.11 FINAL ACCEPTANCE TEST

Final Acceptance Test shall begin only when the Preliminary Test Report has been approved. The Fire Protection Specialist shall conduct the Final Acceptance Test and shall provide a complete demonstration of the operation of the system. This shall include operation of control valves and flowing of inspector's test connections to verify operation of associated waterflow alarm switches. After operation of control valves has been completed, the main drain test shall be repeated to assure that control valves are in the open position. In addition, the representative shall have available copies of as-built drawings and certificates of tests previously conducted. The installation shall not be considered accepted until identified discrepancies have been corrected and test documentation is properly completed and received. The Contractor shall submit the Final Acceptance Test Report as specified in the Submittals paragraph.

## 3.12 ON-SITE TRAINING

The Fire Protection Specialist shall conduct a training course for operating and maintenance personnel as designated by the Contracting Officer. Training shall be provided for a period of 2 hours of normal working time and shall start after the system is functionally complete and after the Final Acceptance Test. The On-Site Training shall cover all of the items contained in the approved Operating and Maintenance Instructions.

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## SECTION 13945A

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## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM A 135	(2001) Electric-Resistance-Welded Steel Pipe
ASTM A 183	(1998) Carbon Steel Track Bolts and Nuts
ASTM A 193/A 193M	(2001b) Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A 449	(2000) Quenched and Tempered Steel Bolts and Studs
ASTM A 47/A 47M	(1999) Ferritic Malleable Iron Castings
ASTM A 53/A 53M	(2002) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 536	(1984; R 1999e1) Ductile Iron Castings
ASTM A 563	(2000) Carbon and Alloy Steel Nuts
ASTM A 795	(2000) Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use
ASTM F 436	(2002) Hardened Steel Washers

## AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1015	(1999) Double Check Backflow Prevention Assemblies and Double Check Fire Protection Backflow Prevention Assemblies
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## AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA B300	(1999) Hypochlorites
AWWA B301	(1999) Liquid Chlorine
AWWA C104	(1995) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water



AWWA C110	(1998) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm through 1219 mm), for Water
AWWA C111	(2000) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C151	(2002) Ductile-Iron Pipe, Centrifugally Cast, for Water
AWWA C203	(2002; A C203a-99) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied
AWWA C651	(1999) Disinfecting Water Mains
AWWA C652	(2002) Disinfection of Water-Storage Facilities
AWWA EWW	(1998) Standard Methods for the Examination of Water and Wastewater

## ASME INTERNATIONAL (ASME)

ASME B16.1	(1998) Cast Iron Pipe Flanges and Flanged Fittings
ASME B16.11	(2002) Forged Fittings, Socket-Welding and Threaded
ASME B16.21	(1992) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.9	(2001) Factory-Made Wrought Steel Buttwelding Fittings
ASME B18.2.1	(1996) Square and Hex Bolts and Screws, Inch Series
ASME B18.2.2	(1987; R 1999) Square and Hex Nuts

## FM GLOBAL (FM)

FM P7825a	(2003) Approval Guide Fire Protection
FM P7825b	(2003) Approval Guide Electrical Equipment

## INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41	(1991) Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits
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## MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-71	(1997) Gray Iron Swing Check Valves, Flanged and Threaded Ends
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## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2003) Code for Safety to Life from Fire in Buildings and Structures
NFPA 13	(2002) Installation of Sprinkler Systems
NFPA 13D	(2002) Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes
NFPA 13R	(2002) Installation of Sprinkler Systems in Residential Occupancies Up to and Including Four Stories in Height
NFPA 1963	(2003) Fire Hose Connections
NFPA 24	(2002) Installation of Private Fire Service Mains and Their Appurtenances
NFPA 70	(2002) National Electrical Code
NFPA 72	(2002) National Fire Alarm Code

## NATIONAL INSTITUTE FOR CERTIFICATION IN ENGINEERING TECHNOLOGIES (NICET)

NICET 1014-7	(1995) Program Detail Manual for Certification in the Field of Fire Protection Engineering Technology (Field Code 003) Subfield of Automatic Sprinkler System Layout
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## UNDERWRITERS LABORATORIES (UL)

UL Bld Mat Dir	(2003) Building Materials Directory
UL Fire Prot Dir	(2003) Fire Protection Equipment Directory

## 1.2 GENERAL REQUIREMENTS

Deluge sprinkler system(s) shall be provided in areas indicated on the drawings. The sprinkler system shall provide fire sprinkler protection for the entire area. Except as modified herein, the system shall meet the requirements of NFPA 13 and NFPA 72. The sprinkler system shall be a single interlocked system that requires the actuation of an alarm initiating device to open the water control (deluge) valve. The Contractor shall design any portion of the sprinkler system that are not indicated on the drawings including locating sprinklers, piping, and equipment, and size piping and equipment when this information is not indicated on the drawings or is not specified herein. Pipe sizes which are not indicated on the drawings shall be determined by hydraulic calculations.

## 1.2.1 Hydraulic Design

The system shall be hydraulically designed to discharge a minimum density of 0.10 gpm per square foot for light hazard, 0.15 gpm per square foot for ordinary hazard Group I, 0.20 gpm per square foot for ordinary hazard Group II over the hydraulically most demanding 3900 square feet of floor area.

The minimum pipe size for branch lines in gridded systems shall be (1-1/4 inch). Hydraulic calculations shall be in accordance with the Area/Density Method of NFPA 13. Water velocity in the piping shall not exceed 20 ft/s.

#### 1.2.1.1 Hose Demand

An allowance for exterior hose streams of per occupancy classification shall be added to the sprinkler system demand at the fire hydrant closest to the point where the water service enters the building. An allowance for interior hose stations of per occupancy classification shall also be added to the sprinkler system demand.

#### 1.2.1.2 Basis for Calculations

Verify water supply before designing sprinkler system. The design of the system shall be based on a water supply with a static pressure of 88 psig, and a flow of 1350 gpm at a residual pressure of 81 psig. Water supply shall be presumed available at the test location. Hydraulic calculations shall be based upon the Hazen-Williams formula with a "C" value of 120 for galvanized steel piping, 140 for new cement-lined ductile-iron piping, and 100 for existing underground piping. Add domestic water demand of 90 gpm at base of the risers.

#### 1.2.2 Sprinkler Coverage

Sprinklers shall be uniformly spaced on branch lines. In buildings protected by automatic sprinklers, sprinklers shall provide coverage throughout 100 percent of the building. This includes, but is not limited to, telephone rooms, electrical equipment rooms, boiler rooms, switchgear rooms, transformer rooms, and other electrical and mechanical spaces. Coverage per sprinkler shall be in accordance with NFPA 13, but shall not exceed 100 square feet for extra hazard occupancies, 130 square feet for ordinary hazard occupancies, and 225 square feet for light hazard occupancies. Exceptions are as follows:

- 1) Facilities that are designed in accordance with NFPA 13R and NFPA 13D.
- 2) Sprinklers may be omitted from small rooms which are exempted for specific occupancies in accordance with NFPA 101.

#### 1.2.3 Control System

The control system shall meet the requirements of NFPA 72. The control panel shall be listed in UL Fire Prot Dir or FM P7825a and FM P7825b for "Releasing Device Service". The control panel and the solenoid valve that activates the water control valves shall be compatible with each other. Compatibility shall be per specific UL listing or FM approval of the control equipment.

#### 1.2.3.1 Power Supply

The primary operating power shall be provided from two single-phase 120 VAC circuits. Transfer from normal to backup power and restoration from backup to normal power shall be fully automatic and shall not initiate a false alarm. Loss of primary power shall not prevent actuation of the respective automatic water control valve upon activation of any alarm initiating device. Backup power shall be provided through use of rechargeable, sealed, lead calcium storage batteries.

#### 1.2.3.2 Circuit Requirements

Alarm initiating devices shall be connected to initiating device circuits (IDC), Style D or to signal line circuits (SLC), Style 6, in accordance with NFPA 72. Alarm notification or indicating appliances shall be connected to indicating appliance circuit (IAC), Style W or X in accordance with NFPA 72. A separate circuit shall be provided for actuation of each individual automatic water control valve. The circuits that actuate the water control valves shall be fully supervised so that the occurrence of a single open or a single ground fault condition in the interconnecting conductors shall be indicated at the control panel.

### 1.3 SYSTEM OPERATIONAL FEATURES

The system shall include a heat detection system, manual actuation stations, supervisory and alarm switches, alarm notification appliances, control panel and associated equipment. Preaction sprinkler system piping shall be provided with supervisory air pressure not to exceed 30 psig.

#### 1.3.1 System Actuation

Activation of a smoke detector and heat detector or a single manual actuation station shall actuate alarm zone circuits of the control panel that, in turn, shall actuate the corresponding automatic water control valve. Actuation of the automatic water control valve shall cause water to discharge from the open sprinklers of the deluge system.

#### 1.3.2 Alarm Functions

Activation of any heat detector or sprinkler pressure alarm switch or manual actuation station shall cause the illumination of the respective zone annunciator, and activation of the building fire alarm system. Valve tamper alarm shall be monitored by the system control panel and transmitted to the building fire alarm system as a trouble alarm.

#### 1.3.3 Supervisory Functions

The occurrence of a single open or a single ground fault in any alarm initiating device circuit, in the automatic water control valve actuation circuit, in any alarm indicating appliance circuit or in other electrically supervised circuit shall cause the individually labelled control panel trouble light to be illuminated, the audible trouble alarm to be activated, and a trouble alarm to be transmitted to the building fire alarm control panel.

### 1.4 COORDINATION OF TRADES

Piping offsets, fittings, and any other accessories required shall be furnished as required to provide a complete installation and to eliminate interference with other construction. Sprinkler shall be installed over and under ducts, piping and platforms when such equipment can negatively effect or disrupt the sprinkler discharge pattern and coverage.

### 1.5 DELIVERY AND STORAGE

All equipment delivered and placed in storage shall be housed in a manner to preclude any damage from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Additionally, all pipes shall either be capped or plugged until installed.

## 1.6 FIELD MEASUREMENTS

After becoming familiar with all details of the work, the Contractor shall verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

## 1.7 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-02 Shop Drawings

#### Shop Drawings; G-AE

Six copies of the Sprinkler System Drawings, no later than 21 days prior to the start of sprinkler system installation. The Sprinkler System Drawings shall conform to the requirements established for working plans as prescribed in NFPA 13. Drawings shall include plan and elevation views demonstrating that the equipment will fit the allotted spaces with clearance for installation and maintenance. Each set of drawings shall include the following:

a. Descriptive index of drawings in the submittal with drawings listed in sequence by drawing number. A legend identifying device symbols, nomenclature, and conventions used.

b. Floor plans drawn to a scale not less than  $1/8" = 1'-0"$  which clearly show locations of sprinklers, risers, pipe hangers, seismic separation assemblies, sway bracing, inspector's test connections, drains, and other applicable details necessary to clearly describe the proposed arrangement. Each type of fitting used and the locations of bushings, reducing couplings, and welded joints shall be indicated.

c. Actual center-to-center dimensions between sprinklers on branch lines and between branch lines; from end sprinklers to adjacent walls; from walls to branch lines; from sprinkler feed mains, cross-mains and branch lines to finished floor and roof or ceiling. A detail shall show the dimension from the sprinkler and sprinkler deflector to the ceiling in finished areas.

d. Longitudinal and transverse building sections showing typical branch line and cross-main pipe routing as well as elevation of each typical sprinkler above finished floor.

e. Details of each type of riser assembly; pipe hanger; sway bracing for earthquake protection, and restraint of underground water main at point-of-entry into the building, and electrical devices and interconnecting wiring.

f. Complete point-to-point wiring diagram of the detection and control system. Indicate the detailed interconnection of control

panel modules to the devices, the number and size of conductors in each conduit, and size of conduit. Connection points shall be indicated and coordinated with the terminal identification marked on the devices. Complete internal wiring schematic of the control panel and each electrical device shall be provided. Detailed description of the functions of the control panel and each module shall be provided.

#### As-Built Drawings

As-built drawings, at least 14 days after completion of the Final Tests. The Sprinkler System Drawings shall be updated to reflect as-built conditions after all related work is completed and shall be on reproducible full-size mylar film.

#### SD-03 Product Data

##### Fire Protection Specialist; G-AE

The name and documentation of certification of the proposed Fire Protection Specialists, no later than 14 days after the Notice to Proceed and prior to the submittal of the sprinkler system shop drawings and hydraulic calculations.

The name and documentation of certification of the proposed Fire Protection Specialists, no later than 14 days after the Notice to Proceed and prior to the submittal of the sprinkler system shop drawings and hydraulic calculations.

##### Sprinkler System Installer Qualifications

The name and documentation of certification of the proposed Sprinkler System Installer, concurrent with submittal of the Fire Protection Specialist Qualifications.

The name and documentation of certification of the proposed Sprinkler System Installer, concurrent with submittal of the Fire Protection Specialist Qualifications.

##### Fire Protection Related Submittals

A list of the Fire Protection Related Submittals, no later than 7 days after the approval of the Fire Protection Specialist.

##### Sway Bracing

For systems that are required to be protected against damage from earthquakes, load calculations for sizing of sway bracing.

##### Materials and Equipment; G-AE

Manufacturer's catalog data included with the Sprinkler System Drawings for all items specified herein. The data shall be highlighted to show model, size, options, etc., that are intended for consideration. Data shall be adequate to demonstrate compliance with all contract requirements. In addition, a complete equipment list that includes equipment description, model number and quantity shall be provided.

#### Hydraulic Calculations; G-AE

Hydraulic calculations, including a drawing showing hydraulic reference points and pipe segments.

#### Storage Batteries; G-AE

Calculations to substantiate the total requirements for supervisory and alarm power. Ampere-hour requirements for each system component and each control panel component or module, under both normal and alarm conditions shall be included. The battery recharging period shall be included with the calculations.

#### Spare Parts

Spare parts data for each different item of material and equipment specified.

#### Preliminary Tests; G-AO

Proposed procedures for Preliminary Tests, no later than 14 days prior to the proposed start of the tests.

Proposed date and time to begin Preliminary Tests, submitted with the Preliminary Tests Procedures.

#### Final Acceptance Tests; G-AO

Proposed procedures for Final Acceptance Tests, no later than 14 days prior to the proposed start of the tests.

Proposed date and time to begin Final Acceptance Tests, submitted with the Final Acceptance Test Procedures. Notification shall be provided at least 14 days prior to the proposed start of the test. Notification shall include a copy of the Contractor's Material & Test Certificates.

#### On-Site Training; G-AO

Proposed On-site Training schedule, at least 14 days prior to the start of related training.

### SD-06 Test Reports

#### Preliminary Tests; G-AE

Five copies of the completed Preliminary Tests Reports, no later than 7 days after the completion of the Preliminary Tests. The Preliminary Tests Report shall include both the Contractor's Material and Test Certificate for Underground Piping and the Contractor's Material and Test Certificate for Aboveground Piping. All items in the Preliminary Tests Report shall be signed by the Fire Protection Specialist.

#### Final Acceptance Tests; G-AE

Five copies of the completed Final Acceptance Tests Reports, no later than 7 days after the completion of the Final Acceptance Tests. All items in the Final Acceptance Report shall be signed

by the Fire Protection Specialist.

#### SD-07 Certificates

Inspection by Fire Protection Specialist; G-AE

Concurrent with the Final Acceptance Test Report, certification by the Fire Protection Specialist that the sprinkler system is installed in accordance with the contract requirements, including signed approval of the Preliminary, Detection and Control Systems, and Final Acceptance Test Reports.

#### SD-10 Operation and Maintenance Data

Operating and Maintenance Instructions

Six manuals listing step-by-step procedures required for system startup, operation, shutdown, and routine maintenance, at least 14 days prior to field training. The manuals shall include the manufacturer's name, model number, parts list, list of parts and tools that should be kept in stock by the owner for routine maintenance including the name of a local supplier, simplified wiring and controls diagrams, troubleshooting guide, and recommended service organization (including address and telephone number) for each item of equipment. Each service organization submitted shall be capable of providing 4 hour onsite response to a service call on an emergency basis.

### 1.8 HYDRAULIC CALCULATIONS

Hydraulic calculations shall be as outlined in NFPA 13 except that calculations shall be performed by computer using software intended specifically for fire protection system design using the design data shown on the drawings. Software that uses k-factors for typical branch lines is not acceptable. Calculations shall be based on the water supply data shown on the drawings. Calculations shall substantiate that the design area used in the calculations is the most demanding hydraulically. Water supply curves and system requirements shall be plotted on semi-logarithmic graph paper so as to present a summary of the complete hydraulic calculation. A summary sheet listing sprinklers in the design area and their respective hydraulic reference points, elevations, actual discharge pressures and actual flows shall be provided. Elevations of hydraulic reference points (nodes) shall be indicated. Documentation shall identify each pipe individually and the nodes connected thereto. The diameter, length, flow, velocity, friction loss, number and type fittings, total friction loss in the pipe, equivalent pipe length and Hazen-Williams coefficient shall be indicated for each pipe. For gridded systems, calculations shall show peaking of demand area friction loss to verify that the hydraulically most demanding area is being used. Also for gridded systems, a flow diagram indicating the quantity and direction of flows shall be included. A drawing showing hydraulic reference points (nodes) and pipe designations used in the calculations shall be included and shall be independent of shop drawings.

### 1.9 FIRE PROTECTION SPECIALIST

Work specified in this section shall be performed under the supervision of and certified by the Fire Protection Specialist. The Fire Protection Specialist shall be an individual who is a registered professional engineer



and a Full Member of the Society of Fire Protection Engineers or who is certified as a Level IV Technician by National Institute for Certification in Engineering Technologies (NICET) in the Automatic Sprinkler System Layout subfield of Fire Protection Engineering Technology in accordance with NICET 1014-7. The Fire Protection Specialist shall be regularly engaged in the design and installation of the type and complexity of system specified in the Contract documents, and shall have served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months.

#### 1.10 SPRINKLER SYSTEM INSTALLER QUALIFICATIONS

Work specified in this section shall be performed by the Sprinkler System Installer. The Sprinkler System Installer shall be regularly engaged in the installation of the type and complexity of system specified in the Contract documents, and shall have served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months.

#### 1.11 REGULATORY REQUIREMENTS

Compliance with referenced NFPA standards is mandatory. This includes advisory provisions listed in the appendices of such standards, as though the word "shall" had been substituted for the word "should" wherever it appears. Applicable material and installation standards referenced in Appendix A of NFPA 13 and NFPA 24 shall be considered mandatory the same as if such referenced standards were specifically listed in this specification. In the event of a conflict between specific provisions of this specification and applicable NFPA standards, this specification shall govern. All requirements that exceed the minimum requirements of NFPA 13 shall be incorporated into the design. Reference to "authority having jurisdiction" shall be interpreted to mean the Contracting Officer.

#### 1.12 SPARE PARTS

The Contractor shall submit spare parts data for each different item of material and equipment specified. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of parts recommended by the manufacturer to be replaced after 1 year and 3 years of service. A list of special tools and test equipment required for maintenance and testing of the products supplied by the Contractor shall be included.

### PART 2 PRODUCTS

#### 2.1 STANDARD PRODUCTS

Materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

#### 2.2 NAMEPLATES

All equipment shall have a nameplate that identifies the manufacturer's name, address, type or style, model or serial number, and catalog number.

## 2.3 REQUIREMENTS FOR FIRE PROTECTION SERVICE

Materials and equipment shall have been tested by Underwriters Laboratories, Inc. and listed in UL Fire Prot Dir or approved by Factory Mutual and listed in FM P7825a and FM P7825b. Where the terms "listed" or "approved" appear in this specification, such shall mean listed in UL Fire Prot Dir or FM P7825a and FM P7825b.

## 2.4 UNDERGROUND PIPING SYSTEMS

### 2.4.1 Pipe

Piping from a point 6 inches above the floor to a point 5 feet outside the building wall shall be ductile iron with a rated working pressure of 150 psi conforming to AWWA C151, with cement mortar lining conforming to AWWA C104. Piping more than 5 feet outside the building walls shall comply with Section 02510A WATER DISTRIBUTION SYSTEM.

### 2.4.2 Fittings and Gaskets

Fittings shall be ductile iron conforming to AWWA C110. Gaskets shall be suitable in design and size for the pipe with which such gaskets are to be used. Gaskets for ductile iron pipe joints shall conform to AWWA C111.

### 2.4.3 Gate Valve and Indicator Posts

Gate valves for underground installation shall be of the inside screw type with counter-clockwise rotation to open. Where indicating type valves are shown or required, indicating valves shall be gate valves with an approved indicator post of a length to permit the top of the post to be located 3 feet above finished grade. Gate valves and indicator posts shall be listed in UL Fire Prot Dir or FM P7825a and FM P7825b.

## 2.5 ABOVEGROUND PIPING COMPONENTS

### 2.5.1 Steel Pipe

Except as modified herein, steel pipe shall be galvanized conforming to the applicable requirements of NFPA 13, and ASTM A 795, ASTM A 53/A 53M, or ASTM A 135. Pipe in which threads or grooves are cut shall be Schedule 40 or shall be listed by Underwriters' Laboratories to have a corrosion resistance ratio (CRR) of 1.0 or greater after threads or grooves are cut. Pipe shall be marked with the name of the manufacturer, kind of pipe, and ASTM designation.

### 2.5.2 Fittings for Non-Grooved Steel Pipe

Fittings shall be galvanized steel conforming to ASME B16.9 or ASME B16.11. Fittings that sprinklers, drop nipples or riser nipples (sprigs) are screwed into shall be threaded type. Plain-end fittings with mechanical couplings, fittings that use steel gripping devices to bite into the pipe and segmented welded fittings shall not be used.

### 2.5.3 Grooved Mechanical Joints and Fittings

Joints and fittings shall be designed for not less than 175 psi service and shall be the product of the same manufacturer; segmented welded fittings shall not be used. Fitting and coupling houses shall be malleable iron conforming to ASTM A 47/A 47M, Grade 32510; ductile iron conforming to ASTM

A 536, Grade 65-45-12. Gaskets shall be of silicon compound and approved for dry fire protection systems. Gasket shall be the flush type that fills the entire cavity between the fitting and the pipe. Nuts and bolts shall be heat-treated steel conforming to ASTM A 183 and shall be cadmium plated or zinc electroplated.

#### 2.5.4 Flanges

Flanges shall conform to NFPA 13 and ASME B16.1. Gaskets shall be non-asbestos compressed material in accordance with ASME B16.21, 1/16 inch thick, and full face or self-centering flat ring type.

##### 2.5.4.1 Bolts

Bolts shall be squarehead conforming to ASME B18.2.1, ASTM A 449, Type 1 or 2. Bolts shall extend no less than three full threads beyond the nut with bolts tightened to the required torque.

##### 2.5.4.2 Nuts

Nuts shall be hexagon type conforming to ASME B18.2.2, ASTM A 193/A 193M, Grade 5, ASTM A 563, Grade C3 or DH3.

##### 2.5.4.3 Washers

Washers shall meet the requirements of ASTM F 436. Flat circular washers shall be provided under all bolt heads and nuts.

#### 2.5.5 Pipe Hangers

Hangers shall be listed in UL Fire Prot Dir or FM P7825a and FM P7825b and of the type suitable for the application, construction, and pipe type and size to be supported.

#### 2.5.6 Valves

##### 2.5.6.1 Control Valve and Gate Valve

Manually operated sprinkler control valve and gate valve shall be outside stem and yoke (OS&Y) type and shall be listed in UL Bld Mat Dir or FM P7825a and FM P7825b.

##### 2.5.6.2 Check Valves

Check valve 2 inches and larger shall be listed in UL Bld Mat Dir or FM P7825a and FM P7825b. Check valves 4 inches and larger shall be of the swing type with flanged cast iron body and flanged inspection plate, shall have a clear waterway and shall meet the requirements of MSS SP-71, for Type 3 or 4.

#### 2.6 AUTOMATIC WATER CONTROL VALVE (DELUGE VALVE)

Automatic water control valve (deluge valve) shall be electrically-actuated and rated for a working pressure of 175 psi. Valve shall be capable of being reset without opening the valve. Electrical solenoid valve used to actuate the water control valve shall be an integral component of the valve or shall be approved for use by the water control valve manufacturer. Solenoid valve shall be rated at 24 volts direct current, and shall be normally closed type that operates when energized. Solenoid valves shall

be rated for a maximum pressure differential of 175 psi. Water control valve shall be equipped with a means to prevent the valve from returning to the closed position until being manually reset. Assembly shall be complete with the valve manufacturer's standard trim piping, drain and test valves, pressure gauges, and other required appurtenances. Each assembly shall include an emergency release device for manually tripping the water control valve in the event of a power or other system failure. Device shall be a standard accessory component of the valve manufacturer and shall be labeled as to its function and method of operation. Valves located in hazardous locations shall be approved for the hazard classification of the area where located.

## 2.7 WATER MOTOR ALARM ASSEMBLY

Assembly shall include a body housing, impeller wheel, drive shaft, striker assembly, gong, wall plate and related components necessary for complete operation. Minimum 3/4 inch galvanized piping shall be provided between the housing and the automatic water control valve. Drain piping from the body housing shall be minimum 1 inch galvanized steel and shall be arranged to drain to the outside of the building. Piping shall be galvanized both on the inside and on the outside surfaces.

## 2.8 FIRE DEPARTMENT CONNECTION

Fire department connection shall be projecting type with cast brass body, matching wall escutcheon lettered "Auto Spkr" with a polished brass finish. The connection shall have two inlets with individual self-closing clappers, caps with drip drains and chains. Female inlets shall have 2-1/2 inch diameter American National Fire Hose Connection Screw Threads (NH) per NFPA 1963.

## 2.9 SPRINKLERS

Sprinklers for preaction systems shall be automatic, fusible solder or glass bulb type; sprinklers for deluge systems shall be open type without the fusible element. Sprinklers with internal O-rings shall not be used. Sprinklers shall be used in accordance with their listed coverage limitations. Temperature classification shall be ordinary or as indicated. Sprinklers in high heat areas including attic spaces or in close proximity to unit heaters shall have temperature classification in accordance with NFPA 13. Extended coverage sprinklers shall not be used.

### 2.9.1 Pendent Sprinkler

Pendent sprinkler shall be of the fusible strut or glass bulb type, recessed type with nominal 1/2 inch or 17/32 inch orifice. Pendent sprinklers shall have a polished chrome finish.

### 2.9.2 Upright Sprinkler

Upright sprinkler shall be brass and shall have a nominal 1/2 inch or 17/32 inch orifice.

### 2.9.3 Corrosion Resistant Sprinkler

Corrosion resistant sprinkler shall be the upright or pendent type installed in locations as indicated. Corrosion resistant coatings shall be factory-applied by the sprinkler manufacturer.

## 2.10 DISINFECTING MATERIALS

### 2.10.1 Liquid Chlorine

Liquid chlorine shall conform to AWWA B301.

### 2.10.2 Hypochlorites

Calcium hypochlorite and sodium hypochlorite shall conform to AWWA B300.

## 2.11 ACCESSORIES

### 2.11.1 Sprinkler Cabinet

Spare sprinklers shall be provided in accordance with NFPA 13 and shall be packed in a suitable metal or plastic cabinet. Spare sprinklers shall be representative of, and in proportion to, the number of each type and temperature rating of the sprinklers installed. At least one wrench of each type required shall be provided.

### 2.11.2 Pendent Sprinkler Escutcheon

Escutcheon shall be one-piece metallic type with a depth of less than 3/4 inch and suitable for installation on pendent sprinklers. The escutcheon shall have a factory finish that matches the pendent sprinkler heads.

### 2.11.3 Pipe Escutcheon

Escutcheon shall be polished chromium-plated zinc alloy, or polished chromium-plated copper alloy. Escutcheons shall be either one-piece or split-pattern, held in place by internal spring tension or set screw.

### 2.11.4 Sprinkler Guard

Guard shall be a steel wire cage designed to encase the sprinkler and protect it from mechanical damage. Guards shall be provided on sprinklers located inside the rack or within 7 feet or less from the floor..

### 2.11.5 Identification Sign

Valve identification sign shall be minimum 6 inches wide by 2 inches high with enamel baked finish on minimum 18 gauge steel or 0.024 inch aluminum with red letters on a white background or white letters on red background. Wording of sign shall include, but not be limited to "main drain," "auxiliary drain," "inspector's test," "alarm test," "alarm line," and similar wording as required to identify operational components.

## 2.12 DOUBLE-CHECK VALVE BACKFLOW PREVENTION ASSEMBLY

Double-check backflow prevention assembly shall comply with ASSE 1015. The assembly shall have a bronze, cast-iron or stainless steel body with flanged ends. The assembly shall include pressure test gauge ports and OS&Y shutoff valves on the inlet and outlet, 2-positive-seating check valve for continuous pressure application, and four test cocks. Assemblies shall be rated for working pressure of 150 psi. The maximum pressure loss shall be 6 psi at a flow rate equal to the sprinkler water demand, at the location of the assembly. A test port for a pressure gauge shall be provided both upstream and downstream of the double check backflow prevention assembly valves.

## 2.13 CONTROL PANEL

Panel shall be UL listed or FM approved for "Releasing Device Service" or shall have modules approved for this purpose. Panel shall contain all components and equipment required to provide the specified operational and supervisory functions of the system. Components shall be housed in a surface-mounted steel cabinet with hinged door and cylinder lock. Control panel shall be a clean, uncluttered, and orderly factory assembled and wired unit. Panel shall include integral "power on," "alarm," and "trouble" lamps with annunciation of each alarm, supervisory and trouble signal. The panel shall have prominent rigid plastic or metal identification plates for lamps, zones, controls, meters, fuses, and switches. Nameplates for fuses shall also include ampere rating. Control panel switches shall be within the locked cabinet. A suitable means shall be provided for testing the working condition and accuracy of the control panel visual indicating devices (meter and lamps). Meters and lamps shall be plainly visible when the cabinet door is closed. Signals shall be provided to indicate by zone any alarm, supervisory or trouble condition on the system. Upon restoration of power, startup shall be automatic, and shall not require any manual operation. The loss of primary power or the sequence of applying primary or emergency power shall not affect the transmission of alarm, supervisory or trouble signals.

### 2.13.1 Zone Annunciator

A separate alarm and trouble lamp shall be provided for each active and spare zone and shall be located on exterior of cabinet door or be visible through the cabinet door. A minimum of two spare alarm zones that are fully operational shall be provided. Each lamp shall provide specific identification of the zone by means of a permanently attached rigid plastic or metal sign with either raised or engraved letters. Zone identification shall consist of a unique zone number as well as a word description of the zone.

### 2.13.2 System Zoning

The system shall be zoned as follows:

ZONE NO.	DESCRIPTION
1	Wet Sprinkler
2	Alpha Simulator Deluge
3	Bravo Simulator Deluge

### 2.13.3 Primary Power Supply

Primary power and trouble alarm power to the Control Panel shall be supplied from two 120 VAC circuits. Power to the control panel shall be as indicated. Panel shall be permanently marked "DELUGE SPRINKLER SYSTEM".

### 2.13.4 Emergency Power Supply

Emergency power shall be provided for system operation in the event of failure of the primary power supply and shall consist of rechargeable storage battery system. Transfer from normal to emergency power or restoration from emergency to normal power shall be automatic and shall not cause transmission of a false alarm.

#### 2.13.4.1 Storage Batteries

Storage Batteries shall be sealed, lead-calcium type requiring no additional water. The batteries shall have ample capacity, with primary power disconnected, to operate the system for a period of 90 hours. Following this period of operation via batteries, the batteries shall have ample capacity to operate all alarm indicating devices in the alarm mode for a minimum period of 15 minutes. Battery cabinet shall be a separate compartment at the bottom of the control panel. The battery cabinet shall have adequate space for spare duplicate storage batteries. Batteries shall be mounted on a noncorrosive and nonconductive base or pad.

#### 2.13.4.2 Battery Charger

Battery charger shall be completely automatic, with high/low charging rate, capable of restoring the batteries from full discharge to full charge within 12 hours using the high charging rate. A separate ammeter shall be provided for indicating rate of charge. A separate voltmeter shall be provided to indicate the state of the battery charge. A pilot light indicating when batteries are manually placed on a high rate of charge shall be provided as part of the unit assembly. The charger shall be located in control panel cabinet.

### 2.14 ALARM INITIATING DEVICES

#### 2.14.1 Heat Detectors

Detectors located in areas subject to moisture, exterior atmospheric conditions or hazardous locations as defined in NFPA 70 shall be approved for such locations. Detectors shall be listed or approved for 50 foot spacing between detectors. The detector shall be equipped with an alarm indicating light in its base that lights when the detector is in an alarm condition. Five spare detectors of each type and temperature rating shall be provided.

##### 2.14.1.1 Rate Compensation Detector

Detector shall be of the horizontal spot type with a temperature classification rating of ordinary as defined by NFPA 72. Detectors listed or approved as "rate anticipation" type will be accepted. Detector shall automatically reset when temperature drops below detector temperature rating. Detector shall be hermetically sealed.

##### 2.14.1.2 Combination Fixed-Temperature and Rate-of-Rise Heat Detector

Detector shall consist of two independently operated thermal elements. The rate-of-rise portion of the detector shall consist of an air chamber, flexible metal diaphragm and a moisture-proof calibrated vent which will respond to a temperature rise exceeding 15 degrees F per minute. This portion of the detector shall be self-restoring after actuation. The fixed temperature portion of the detector shall consist of a fusible alloy that will melt and cause an alarm when the surrounding air rises above the temperature rating of the detector. The detector shall provide an external indication when the fixed temperature portion of the detector actuates. Detector shall have a temperature classification rating of ordinary as defined by NFPA 72.

#### 2.14.1.3 Fixed-Temperature Heat Detector

Detector shall have a fusible alloy that will melt and cause an alarm when the surrounding air rises above the temperature rating of the detector. The detector shall provide an external indication upon actuation of the detector. Detector shall provide a temperature classification rating of ordinary as defined by NFPA 72.

#### 2.14.2 Manual Actuation Station

Station shall be mounted at 42 inches above the floor, unless otherwise shown. Station shall be arranged to activate the deluge system. Station shall be dual-action type requiring two separate operations in order to cause system discharge. Station shall be colored lime yellow. Station shall be provided with a positive visible indication of operation of the station. Station shall be weatherproof type and shall be provided with an engraved label indicating DELUGE SYSTEM.

#### 2.14.3 Sprinkler Pressure Alarm Switch

Pressure switch shall include a metal housing with a neoprene diaphragm, SPDT snap action switches. The switch shall have a service pressure rating of 175 psi. There shall be two SPDT (Form C) contacts factory adjusted to operate at 4 to 8 psi. The switch shall be capable of being mounted in any position in the alarm line trim piping of the alarm check valve.

#### 2.14.4 Waterflow Alarm

Electrically operated, exterior-mounted, waterflow alarm bell shall be provided and installed in accordance with NFPA 13. Waterflow alarm bell shall be rated 24 VDC and shall be connected to the Fire Alarm Control Panel (FACP) in accordance with Section 13851A FIRE DETECTION AND ALARM SYSTEM, ADDRESSABLE. Mechanically operated, exterior mounted, water motor alarm assembly shall be provided in accordance with NFPA 13. Water motor alarm assembly shall include a body housing, impeller or pelton wheel, drive shaft, striker assembly, gong, wall plate and related components necessary for complete operation. Minimum 3/4 inch galvanized piping from the body housing shall be provided between the housing and the alarm check valve. Drain piping from the body housing shall be minimum 1 inch galvanized and shall be arranged to drain to the outside of the building. Piping shall be galvanized both on the inside and outside surfaces.

#### 2.14.5 Valve Supervisory (Tamper) Switch

Switch shall be suitable for mounting to the type of control valve to be supervised open. The switch shall be tamper resistant and contain one set of SPDT (Form C) contacts arranged to transfer upon removal of the housing cover or closure of the valve of more than two rotations of the valve stem.

### 2.15 NOTIFICATION APPLIANCES

Notification appliances shall be suitable for connection to supervised alarm indicating circuits. Appliance shall have a separate screw terminal for each conductor. The surface of the appliance shall be red in color.

#### 2.15.1 Alarm Bell

Bell shall be 10 inch diameter, surface-mounted vibrating type with matching back box. Sound output shall be a minimum of 85 DBA at 10 feet.



Bell shall operate on nominal 24 VDC. Bells shall have screw terminals for in-out wiring connection. Bells used in exterior locations shall be specifically listed or approved for outdoor use and be provided with metal housing and protective grilles.

#### 2.15.2 Alarm Horn

Horn shall be surface mounted, with the matching mounting back box surface mounted vibrating type suitable for use in an electrically supervised circuit. Horns shall operate on nominal 24 VDC and have screw terminals for in-out wiring connection. Sound output shall be a minimum of 85 DBA at 10 feet. Horns used in exterior locations shall be specifically listed or approved for outdoor use and be provided with metal housing and protective grills.

#### 2.16 WIRING

Wiring for alternating current (AC) circuits shall be 12 AWG minimum. Wiring for low voltage direct current (DC) circuits shall be No. 16 AWG minimum. Power wiring (over 28 volts) and control wiring shall be isolated. Wiring shall conform to NFPA 70. System field wiring shall be solid copper and installed in electrical metallic tubing or in metallic conduit, except rigid plastic conduit may be used under slab-on-grade. Conductors shall be color coded. Conductors used for the same function shall be similarly color coded. Wiring color code shall remain uniform throughout the circuit. Pigtail or T-tap connections to alarm initiating, alarm indicating, supervisory, and actuation circuits are prohibited.

### PART 3 EXECUTION

#### 3.1 FIRE PROTECTION RELATED SUBMITTALS

The Fire Protection Specialist shall prepare a list of the submittals from the Contract Submittal Register that relate to the successful installation of the sprinkler systems(s). The submittals identified on this list shall be accompanied by a letter of approval signed and dated by the Fire Protection Specialist when submitted to the Government.

#### 3.2 INSTALLATION REQUIREMENTS

The installation shall be in accordance with the applicable provisions of publications referenced herein.

#### 3.3 INSPECTION BY FIRE PROTECTION SPECIALIST

The Fire Protection Specialist shall inspect the sprinkler system periodically during the installation to assure that the sprinkler system installed in accordance with the contract requirements. The Fire Protection Specialist shall witness the preliminary and final tests, and shall sign the test results. The Fire Protection Specialist, after completion of the system inspections and a successful final test, shall certify in writing that the system has been installed in accordance with the contract requirements. Any discrepancy shall be brought to the attention of the Contracting Officer in writing, no later than three working days after the discrepancy is discovered.

### 3.4 ABOVEGROUND PIPING INSTALLATION

#### 3.4.1 Protection of Piping Against Earthquake Damage

The system piping shall be protected against damage from earthquakes. Seismic protection shall include flexible and rigid couplings, sway bracing, seismic separation assemblies where piping crosses building seismic separation joints, and other features as required by NFPA 13 for protection of piping against damage from earthquakes.

#### 3.4.2 Piping in Exposed Areas

Exposed piping shall be installed so as not diminish exit access widths, corridors, or equipment access. Exposed horizontal piping, including drain piping, shall be installed to provide maximum headroom.

#### 3.4.3 Piping in Finished Areas

In areas with suspended or dropped ceilings and in areas with concealed spaces above the ceiling, piping shall be concealed above ceilings. Piping shall be inspected, tested and approved before being concealed. Risers and similar vertical runs of piping in finished areas shall be concealed.

#### 3.4.4 Pendent Sprinklers Locations

Sprinklers installed in the pendent position shall be of the listed dry pendent type, unless otherwise indicated. Dry pendent sprinklers shall be of the required length to permit the sprinkler to be threaded directly into a branch line tee. Hangers shall be provided on arm-overs exceeding 12 inches in length. Dry pendent sprinkler assemblies shall be such that sprinkler ceiling plates or escutcheons are of the uniform depth throughout the finished space. Pendent sprinklers in suspended ceilings shall be a minimum of 6 inches from ceiling grid. Recessed pendent sprinklers shall be installed such that the distance from the sprinkler deflector to the underside of the ceiling shall not exceed the manufacturer's listed range and shall be of uniform depth throughout the finished area.

#### 3.4.5 Upright Sprinklers

Riser nipples or "sprigs" to upright sprinklers shall contain no fittings between the branch line tee and the reducing coupling at the sprinkler. Riser nipples exceeding 30 inches in length shall be individually supported.

#### 3.4.6 Pendent Sprinklers Locations

Sprinklers installed in the pendent position shall be of the listed dry pendent type, unless otherwise indicated. Dry pendent sprinklers shall be of the required length to permit the sprinkler to be threaded directly into a branch line tee. Hangers shall be provided on arm-overs exceeding 12 inches in length. Dry pendent sprinkler assemblies shall be such that sprinkler ceiling plates or escutcheons are of the uniform depth throughout the finished space. Pendent sprinklers in suspended ceilings shall be a minimum of 6 inches from ceiling grid. Recessed pendent sprinklers shall be installed such that the distance from the sprinkler deflector to the underside of the ceiling shall not exceed the manufacturer's listed range and shall be of uniform depth throughout the finished area.

#### 3.4.7 Pipe Joints

Pipe joints shall conform to NFPA 13, except as modified herein. Not more than four threads shall show after joint is made up. Welded joints will be permitted, only if welding operations are performed as required by NFPA 13 at the Contractor's fabrication shop, not at the project construction site.

Flanged joints shall be provided where indicated or required by NFPA 13. Grooved pipe and fittings shall be prepared in accordance with the manufacturer's latest published specification according to pipe material, wall thickness and size. Grooved couplings and fittings shall be from the same manufacturer. Grooved joints shall not be used in concealed locations, such as behind solid walls or ceilings, unless an access panel is shown on the drawings for servicing or adjusting the joint.

#### 3.4.8 Reducers

Reductions in pipe sizes shall be made with one-piece tapered reducing fittings. The use of grooved-end or rubber-gasketed reducing couplings will not be permitted. When standard fittings of the required size are not manufactured, single bushings of the face type will be permitted. Where used, face bushings shall be installed with the outer face flush with the face of the fitting opening being reduced. Bushings shall not be used in elbow fittings, in more than one outlet of a tee, in more than two outlets of a cross, or where the reduction in size is less than 1/2 inch.

#### 3.4.9 Pipe Penetrations

Cutting structural members for passage of pipes or for pipe-hanger fastenings will not be permitted. Pipes that must penetrate concrete or masonry walls or concrete floors shall be core-drilled and provided with pipe sleeves. Each sleeve shall be Schedule 40 galvanized steel, ductile iron or cast iron pipe and shall extend through its respective wall or floor and be cut flush with each wall surface. Sleeves shall provide required clearance between the pipe and the sleeve per NFPA 13. The space between the sleeve and the pipe shall be firmly packed with mineral wool insulation. Where pipes penetrate fire walls, fire partitions, or floors, pipes shall be fire stopped in accordance with Section 07840 FIRESTOPPING. In penetrations that are not fire-rated or not a floor penetration, the space between the sleeve and the pipe shall be sealed at both ends with plastic waterproof cement that will dry to a firm but pliable mass or with a mechanically adjustable segmented elastomer seal.

#### 3.4.10 Escutcheons

Escutcheons shall be provided for pipe penetration of ceilings and walls. Escutcheons shall be securely fastened to the pipe at surfaces through which piping passes.

#### 3.4.11 Inspector's Test Connection

Unless otherwise indicated, test connection shall consist of 1 inch pipe connected to the remote branch line; a test valve located approximately 7 feet above the floor; a smooth bore brass outlet equivalent to the smallest orifice sprinkler used in the system; and a painted metal identification sign affixed to the valve with the words "Inspector's Test." The discharge orifice shall be located outside the building wall directed so as not to cause damage to adjacent construction or landscaping during full flow discharge.

#### 3.4.12 Drains

Main drain piping shall be provided to discharge at a safe point outside the building. Auxiliary drains shall be provided as indicated and as required by NFPA 13. When the capacity of trapped sections of pipe is less than 3 gallons, the auxiliary drain shall consist of a valve not smaller than 1/2 inch and a plug or nipple and cap. When the capacity of trapped sections of piping is more than 3 gallons, the auxiliary drain shall consist of two 1 inch valves and one 2 x 12 inch condensate nipple or equivalent, located in an accessible location. Tie-in drains shall be provided for multiple adjacent trapped branch pipes and shall be a minimum of 1 inch in diameter. Tie-in drain lines shall be pitched a minimum of 1/2 inch per 10 feet.

#### 3.4.13 Installation of Fire Department Connection

Connection shall be mounted on the exterior wall approximately 3 feet above finished grade and on the sprinkler system side of the backflow preventer. The piping between the connection and the check valve shall be provided with an automatic drip in accordance with NFPA 13 and arranged to drain to the outside.

#### 3.4.14 Identification Signs

Signs shall be affixed to each control valve, inspector test valve, main drain, auxiliary drain, test valve, and similar valves as appropriate or as required by NFPA 13. Hydraulic design data nameplates shall be permanently affixed to each sprinkler riser as specified in NFPA 13.

### 3.5 UNDERGROUND PIPING INSTALLATION

The fire protection water main shall be laid, and joints anchored, in accordance with NFPA 24. Minimum depth of cover shall be per NFPA 24. The supply line shall terminate inside the building with a flanged piece, the bottom of which shall be set not less than 6 inches above the finished floor. A blind flange shall be installed temporarily on top of the flanged piece to prevent the entrance of foreign matter into the supply line. A concrete thrust block shall be provided at the elbow where the pipe turns up toward the floor. In addition, joints shall be anchored in accordance with NFPA 24 using pipe clamps and steel rods from the elbow to the flange above the floor and from the elbow to a pipe clamp in the horizontal run of pipe. Buried steel components shall be provided with a corrosion protective coating in accordance with AWWA C203. Piping more than 5 feet outside the building walls shall meet the requirements of Section 02510A WATER DISTRIBUTION SYSTEM.

### 3.6 EARTHWORK

Earthwork shall be performed in accordance with applicable provisions of Section 02300 EARTHWORK.

### 3.7 ELECTRICAL WORK

Unless otherwise specified herein, power supply equipment and wiring shall be in accordance with Section 16415A ELECTRICAL WORK, INTERIOR.

### 3.7.1 Overcurrent and Surge Protection

All equipment connected to alternating current circuits shall be protected from surges per IEEE C62.41 and NFPA 70. Cables and conductors that serve as communications links, except fiber optics, shall have surge protection circuits installed at each end. Fuses shall not be used for surge protection.

### 3.7.2 Grounding

Grounding shall be provided to building ground.

### 3.7.3 Wiring

System field wiring shall be installed in 3/4 inch minimum diameter electrical metallic tubing or metallic conduit. Wiring for the sprinkler system fire detection and control system shall be installed in tubing or conduits dedicated for that use only and not installed in conduit, outlet boxes or junction boxes which contain lighting and power wiring or equipment. Circuit conductors entering or leaving any mounting box, outlet box enclosure or cabinet shall be connected to screw terminals with each terminal marked and labeled in accordance with the wiring diagram. No more than one conductor shall be installed under any screw terminal. Connections and splices shall be made using screw terminal blocks. The use of wire nut type connectors is not permitted. Wiring within any control equipment shall be readily accessible without removing any component parts.

Conductors shall be color-coded and shall be identified within each enclosure where a connection or termination is made. Conductor identification shall be by plastic-coated, self-sticking, printed markers or by heat-shrink type sleeves. Circuits shall be wired to maintain electrical supervision so that removal of any single wire from any device shall cause a "trouble" condition on the control panel.

### 3.7.4 Control Panel

The control panel and its assorted components shall be mounted so that no part of the enclosing cabinet is less than 24 inches and not more than 78 inches above the finished floor.

### 3.7.5 Detectors

Detectors shall be ceiling-mounted per NFPA 72 and shall be at least 12 inches from any part of any lighting fixture. Detectors shall be located at least 3 feet from diffusers of air handling systems. Each detector shall be provided with appropriate mounting hardware as required by its mounting location.

### 3.7.6 Manual Actuation Stations

Manual actuation stations shall be mounted readily accessible and 42 inches above the finished floor.

### 3.7.7 Notification Appliances

Notification appliances shall be mounted a minimum of 8 feet above the finished floor unless limited by ceiling height.

### 3.8 DISINFECTION

After all system components are installed and hydrostatic test(s) are successfully completed, each portion of the sprinkler system to be disinfected shall be thoroughly flushed with potable water until all entrained dirt and other foreign materials have been removed before introducing chlorinating material. Flushing shall be conducted by removing the flushing fitting of the cross mains and of the grid branch lines, and then back-flushing through the sprinkler main drains. The chlorinating material shall be hypochlorites or liquid chlorine. Water chlorination procedure shall be in accordance with AWWA C651 and AWWA C652. The chlorinating material shall be fed into the sprinkler piping at a constant rate of 50 parts per million (ppm). A properly adjusted hypochlorite solution injected into the system with a hypochlorinator, or liquid chlorine injected into the system through a solution-fed chlorinator and booster pump shall be used. Chlorination application shall continue until the entire system is filled. The water shall remain in the system for a minimum of 24 hours. Each valve in the system shall be opened and closed several times to ensure its proper disinfection. Following the 24-hour period, no less than 25 ppm chlorine residual shall remain in the system. The system shall then be flushed with clean water until the residual chlorine is reduced to less than one part per million. Samples of water in disinfected containers for bacterial examination will be taken from several system locations which are approved by the Contracting Officer. Samples shall be tested for total coliform organisms (coliform bacteria, fecal coliform, streptococcal, and other bacteria) in accordance with AWWA EWW. The testing method shall be either the multiple-tube fermentation technique or the membrane-filter technique. The disinfection shall be repeated until tests indicate the absence of coliform organisms (zero mean coliform density per 100 milliliters) in the samples for at least 2 full days. The system will not be accepted until satisfactory bacteriological results have been obtained. After the successful completion, all sprinklers or plugs and gravity flush all drops or trapped piping.

### 3.9 PIPE COLOR CODE MARKING

Color code marking of piping shall be as specified in Section 09900 PAINTS AND COATINGS.

### 3.10 PRELIMINARY TESTS

The system including the underground water mains, the aboveground piping, detectors and control system and system components shall be tested to assure that equipment and components function as intended. The underground and aboveground interior piping systems and attached appurtenances subjected to system working pressure shall be tested in accordance with NFPA 13 and NFPA 24. Upon completion of specified tests, the Contractor shall complete certificates as specified in paragraph SUBMITTALS.

#### 3.10.1 Underground Piping

##### 3.10.1.1 Flushing

Underground piping shall be flushed in accordance with NFPA 24. This includes the requirement to flush the lead-in connection to the fire protection system at a flow rate not less than the calculated maximum water demand rate of the system.

### 3.10.2 Hydrostatic Testing

New underground piping shall be hydrostatically tested in accordance with NFPA 24. The allowable leakage shall be measured at the specified test pressure by pumping from a calibrated container. The amount of leakage at the joints shall not exceed 2 quarts per hour per 100 gaskets or joints, regardless of pipe diameter.

### 3.10.3 Aboveground Piping

#### 3.10.3.1 Hydrostatic Testing

Aboveground piping shall be hydrostatically tested in accordance with NFPA 13 at not less than 200 psi or 50 psi in excess of maximum system operating pressure and shall maintain that pressure without loss for 2 hours. There shall be no drop in gauge pressure or visible leakage when the system is subjected to the hydrostatic test. The test pressure shall be read from a gauge located at the low elevation point of the system or portion being tested.

#### 3.10.3.2 Air Pressure Test

As specified in NFPA 13, an air pressure leakage test at 50 psi shall be conducted for 24 hours. There shall be no drop in gauge pressure in excess of 1.5 psi for the 24 hours. This air pressure test is in addition to the required hydrostatic test.

#### 3.10.3.3 Backflow Prevention Assembly Forward Flow Test

Each backflow prevention assembly shall be tested at system flow demand, including all applicable hose streams, as specified in NFPA 13. The Contractor shall provide all equipment and instruments necessary to conduct a complete forward flow test, including 2.5 inch diameter hoses, playpipe nozzles, calibrated pressure gauges, and pitot tube gauge. The Contractor shall provide all necessary supports to safely secure hoses and nozzles during the test. At the system demand flow, the pressure readings and pressure drop (friction) across the assembly shall be recorded. A metal placard shall be provided on the backflow prevention assembly that lists the pressure readings both upstream and downstream of the assembly, total pressure drop, and the system test flow rate. The pressure drop shall be compared to the manufacturer's data.

### 3.10.4 Detection and Control System Tests

Upon completion of the installation, the detection and control system shall be subjected to functional and operational performance tests including tests of each installed initiating device, system actuation device and notification appliance. The control system tests specified in paragraph FINAL ACCEPTANCE TESTS shall be conducted to ensure that the system is completely functional and that wiring has been properly connected. If deficiencies are found, corrections shall be made and the system shall be retested to assure that the systems have no deficiencies.

### 3.10.5 Automatic Water Control Valve Test

Each water control valve shall be independently trip-tested in accordance with the manufacturer's published instructions. Each valve shall be electrically trip-tested by actuating a respective heat detector and a manual actuation station connected to the control panel and a manual

actuation device that is part of the valve trim. A full-flow main drain test shall be made. For preaction systems with supervisory air, the air pressure shall be reduced to verify proper operation of the air supply system and associated supervisory alarm devices.

### 3.11 FINAL ACCEPTANCE TESTS

Final Acceptance Test shall begin only when the Preliminary Test Report has been approved. The Fire Protection Specialist shall conduct the Final Acceptance Test and shall provide a complete demonstration of the operation of the system. This shall include operation of control valves and flowing of inspector's test connections to verify operation of associated waterflow alarm switches. After operation of control valves has been completed, the main drain test shall be repeated to assure that control valves are in the open position. Each system shall be completely drained after each trip test. The system air supply system shall be tested to verify that system pressure is restored in the specified time. In addition, the Fire Protection Specialist shall have available copies of as-built drawings and certificates of tests previously conducted. The installation shall not be considered accepted until identified discrepancies have been corrected and test documentation is properly completed and received. After the system has been tested and drained, the system shall be drained periodically for at least 2 weeks until it can be assured that water from the system has been removed.

#### 3.11.1 Control System Test

Testing shall be in accordance with NFPA 72. The test shall include the following:

- a. Visual inspection of wiring connections.
- b. Opening the circuit at each alarm initiating device, solenoid valve, and notification appliance to test the wiring and supervisory features.
- c. Test of each function of the control panel.
- d. Test of each circuit in the normal, open and ground fault modes.
- e. Test of each initiating device in both normal and trouble conditions.
- f. Test of each control circuit and device.
- g. Test of each alarm notification appliance.
- h. Test of the battery charger and batteries.
- i. Operational tests under emergency power supply, including activation of connected alarm notification appliances for the specified time period.

#### 3.11.2 Trip-tests of Automatic Water Control Valves

Each water control valve shall be independently trip-tested in accordance with the manufacturer's published instructions. Each valve shall be electrically trip-tested by actuating a respective heat detector, a manual actuation station connected to the system control panel and the manual



release which is part of the valve trim. Each valve shall be returned to normal condition after each test. Prior to trip testing sprinkler deluge system, precautionary steps shall be taken to prevent water damage to the building and equipment from sprinkler discharge. Control valves on deluge systems shall remain open until open sprinklers have discharged for a minimum of 10 seconds. Control valves on preaction systems shall remain open until piping is filled with water.

### 3.11.3 Tests of Supervisory Air System

Preaction system supervisory air pressure shall be reduced from the normal system pressure to the point at which a low-pressure alarm is sounded. Air pressure shall be restored to verify trouble signal restoration. Automatic start/stop features of air compressor shall be tested.

### 3.12 ON-SITE TRAINING

The Fire Protection Specialist shall conduct a training course for operating and maintenance personnel as designated by the Contracting Officer. Training shall be provided for a period of 2 hours of normal working time and shall start after the system is functionally complete and after the Final Acceptance Test. The On-Site Training shall cover all of the items contained in the approved Operating and Maintenance Instructions.

-- End of Section --

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